

..THE IRON AGE..

ESTABLISHED 1855

NEW YORK, MARCH 17, 1932

VOL. 129, No. 11

A DEPRESSION-PROOF PRODUCT AND HOW IT IS MADE

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Western Editor, The Iron Age

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HARD times are a severe test of adaptability. Those companies which have found it possible to adjust their affairs to rapidly changing business conditions have fared best in the past two years. The organization whose operations are described in this article succeeded so well in this respect that it not only prevented its sales from declining but actually caused them to increase—and substantially at that.

Its merchandising policies reflect unusual alertness to market readjustments. No less impressive are its manufacturing methods, which are here described from the making of castings, through the various machining operations, to final inspection.

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IN a depression year a manufacturer of piston rings turned business losses into substantial gains, showing increases of 25 per cent in gross sales, 60 per cent in replacement sales and 100 per cent in exports. The possessor of this unusual record is the Perfect Circle Co., Hagerstown, Ind., the figures quoted representing gains for the first nine months of 1931 as compared with the corresponding period in 1930. Part of its success is ascribable to an aggressive and well planned sales program. The remainder is attributable to improvement of its product and of the methods used in manufacturing it. When automobile manufacturers are operating in high gear there is a great demand for piston rings. But when auto-

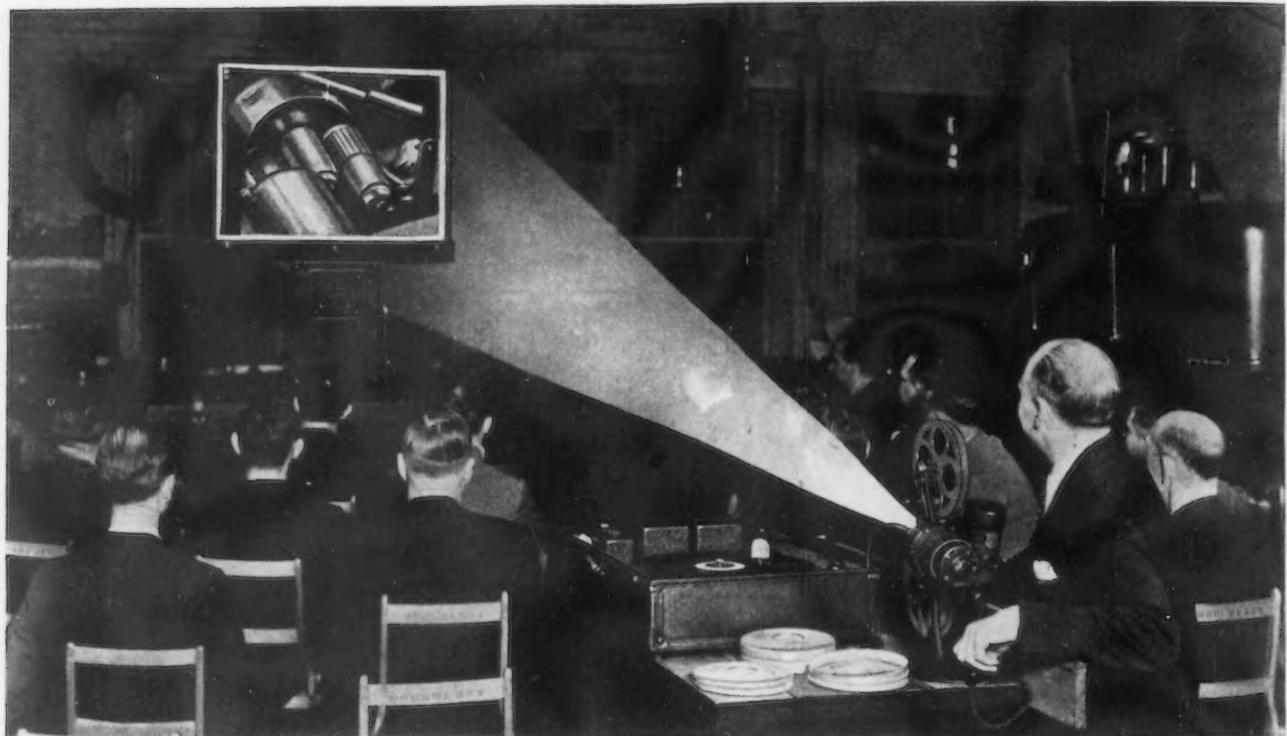
mobile sales lag for an extended period major outlets must be found elsewhere. One way of expanding sales is through jobbers—by increasing the distribution of replacement rings among owners of old cars. Another is by stimulating export demand.



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Here is where foresight plays an important part. In the early stages of the business depression the Perfect Circle Co. sensed the coming changes. It immediately started to build up its jobber outlets. It followed through with an eight-year program of national advertising. It introduced its type 85 oil-regulating ring, which offers better performance to the buyer. For sales promotion it extended all possible assistance to jobbers, even to the extent of providing three-reel talking motion picture programs, which in 10 months of 1931 were exhibited to over 110,000 people. The picture equipment is the product of the Bell & Howell Co., Chicago.

Successful merchandising of a product can be carried on only when manufacturing facilities are



SALES programs include presentation of a talking motion picture. Eighteen factory representatives put on these shows throughout the country.

adequate. The Perfect Circle Co. operates three plants. One of these is a foundry, which is housed in a multi-storied building in the basement of which is storage capacity for about 1000 tons of sand.

Piston rings are cast in "trees," the flask sections being stacked 18 to 20 sections high with center pour to reach each mold. The drag or dummy at the bottom of each tier is a green sand blank. Each flask section is

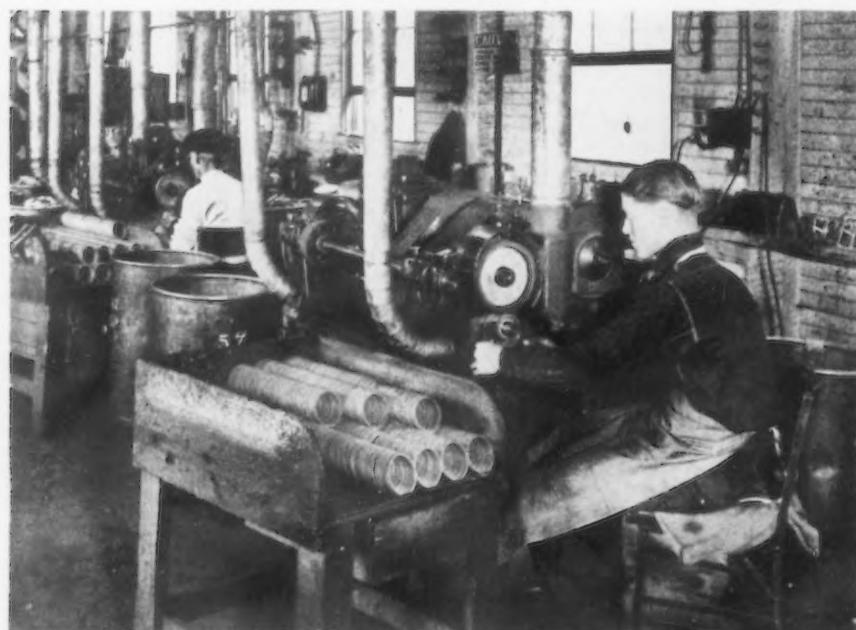
made in a squeezer machine with draw against the head. All molds are made of green sand, the top of one section forming the drag for the section that is superimposed. All flask sections are made of cast iron, some of them being scalloped in contour. Metal pattern plates are employed making from one to eight ring molds depending on the diameter of the ring. Sixty molding machines are in use, two of which make dummy or blank mold bottoms.

The first sand placed on a pattern is hand riddled. Sand is then shoveled into the flask section and struck level with a removable ring which is taken off the flask before the squeezer operates. In this way the density of the sand is controlled. Moisture in the sand is closely checked by the metallurgist, who calculates the necessary addition of water. The required quantity is measured through a meter.

There are two 60-in. cupolas, which have been lined to 45 in., and a third, which has been lined to 30 in. In the power house is an alternating-current motor driving a Roots blower through a Reeves speed reducer which is under remote control from stations at the cupolas. When the foundry is operating at capacity 40 tons of metal is poured in a day. From 50 to 60 per cent of the charge is returned scrap and from 40 to 60 per cent of the iron poured goes into the scrap pile. The high percentage of scrap is not indicative of careless methods but is a result of the character of the product and the unusually severe inspection of the castings.

To illustrate the character of these iron castings it is well to state that the smallest rings measure $1/16$ in. thick, $1/8$ in. wide and $1 \frac{7}{16}$ in. outside diameter. One hundred of these rings weigh 2.7 lb. or less than $1/2$ oz. each. The average weight of all rings cast is $1 \frac{1}{4}$ oz. each.

Hot metal is poured in a center



SCALE from the inside and outside of the annular castings is removed by grinding.

sprue from which it flows to ring gates which feed to the ring molds. Opposite each ring gate there is cast an overflow button which when removed from the ring serves in the tumbler in place of a star. The gate to each ring is broad and thin and is located at the section of the ring which is removed in the machine shop. With this arrangement the separation of the ring from the gate cannot result in a bad break that would cause a defective ring.

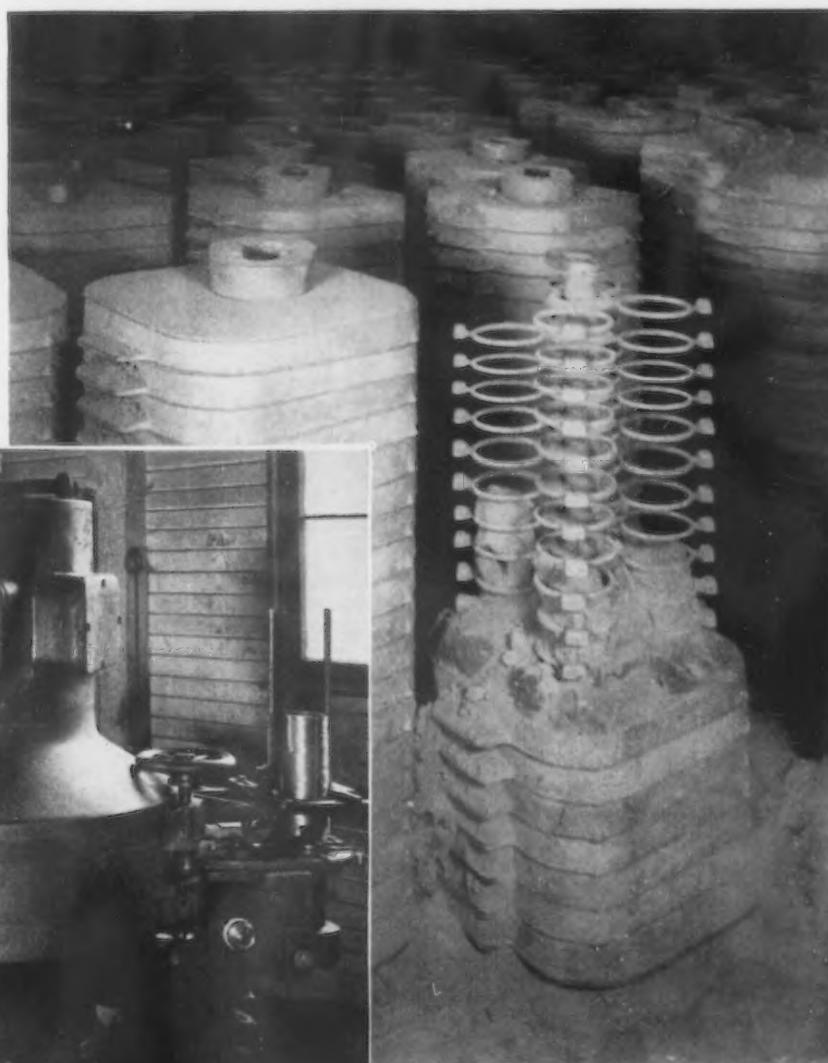
It is interesting to note that the button weighs more than some rings. In addition to the buttons on a "tree," there are the sprue and the ring gates, all of which must be returned for remelting.

The sand problem is well illustrated by the fact that from 0.008 to 0.01 in.

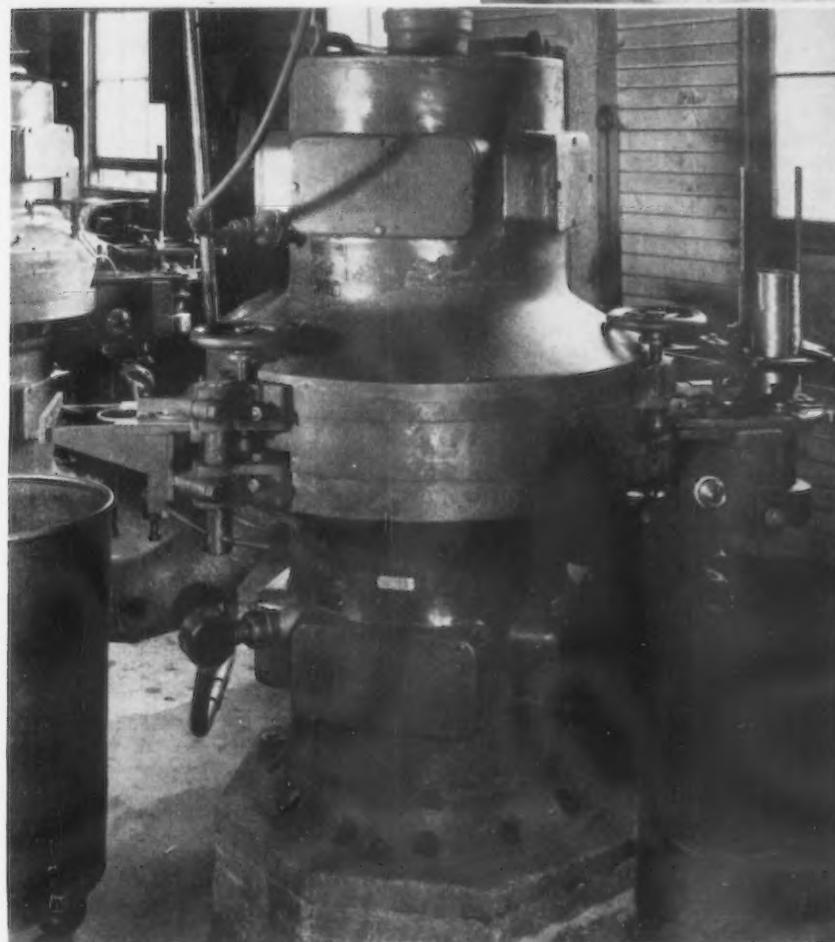
laboratory tests facilitates proper blending.

Pouring temperature is close to 2750 deg. F. at the cupola spout. Optical pyrometer readings are taken

girls inspect 275,000 rings in an 8-hr. day. There is also a sampling department in the foundry, where rings are put through the major machine operations before deliveries are made



PISTON rings are cast in trees. Sprues and overflow buttons represent a large part of the weight of the metal poured.



ROUGH-EDGE grinding is performed on a machine with two facing wheels on separate vertical shafts. A magazine feed (at right) delivers a ring at a time between the wheels. The unequal speeds of the wheels cause the ring to move gradually to the opposite side and out an exit (at right) where it drops into a barrel.

is the allowance on the sides of a ring from casting to finish machining. The sand must have high permeability and still must have fine grain size. Various sands are blended to get the desired results. Each car of sand is stored separately. A card index of

at each tap, which means every 3 to 5 min. A record is kept of these temperatures and the floors on which the various taps are poured.

Rings are broken off the sprues at night over barrels, which are sent to the inspection department where six

from the foundry to the machine shop. Every day more than 1500 rings are machined and tested for tension and hardness. A record of the character of defects is made. If 2 per cent of the product of a pouring floor is found hard the entire output of that floor is scrapped. Dirt holes in 12½ per cent of the pieces tested cause the product of a floor to be scrapped.

Rough casting ring losses are divided into foundry and molder losses. Molders are paid on the Bedaux system, which includes a quality bonus. The foremen, also, are paid a quality bonus. Losses are exhibited in pans on a rack in the inspection department. Each molder has a pan and there are also pans for various kinds

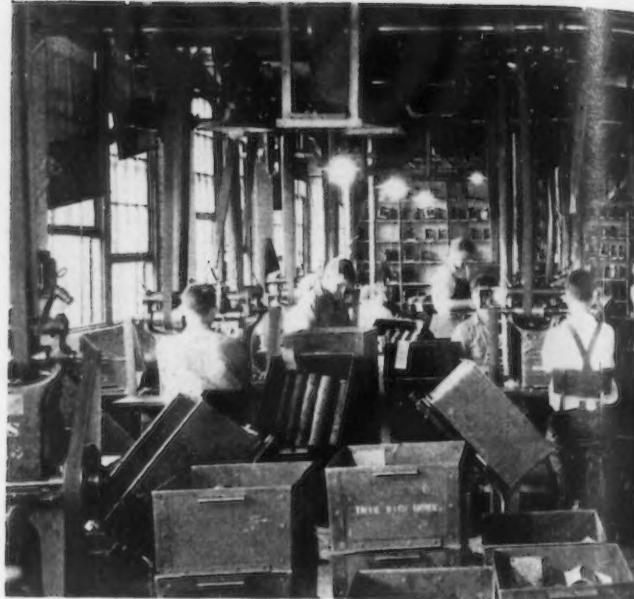
of foundry losses. These boxes are numbered and are open to inspection by molders and other foundrymen so that the character of losses can be studied by the individuals concerned.

Piston rings are transported in barrels from the foundry to the machine shop. The count of rings is made by weight. In the receiving room the rings are put in numbered barrels each of which is permanently mounted on three rollers. With each barrel goes a routing ticket, which is divided into sections on each of which the number of the barrel is printed. Each ticket section designates an operation after the completion of which it is removed and sent to the planning department. Each ticket section also shows the number of rings originally in the barrel, and blank spaces are left in which to record the number of rings delivered from the previous operation and the loss.

Castings Cleaned by Grinding

The first machine shop operation is snag grinding. About a dozen rings are laid loosely in a cradle-like fixture and the inside and outside faces are rough-ground. The grinder is a double-spindle machine, each spindle being parallel with a rubber roller which forces the castings against the grinding wheels. Although this is a rough operation, still it must be accurately performed.

The next operation is rough-edge grinding, which is performed on a machine with two facing wheels on vertical shafts. A separate motor drives each shaft, one of which ro-



tates slightly faster than the other. A magazine feed delivers a ring at a time between the wheel faces. The unequal speeds gradually carry the rings across the wheels to the opposite side, where they are dropped into a barrel. This equipment was made by the Gardner Machine Co., Beloit, Wis. All grinding operations are connected to a central dust removing system.

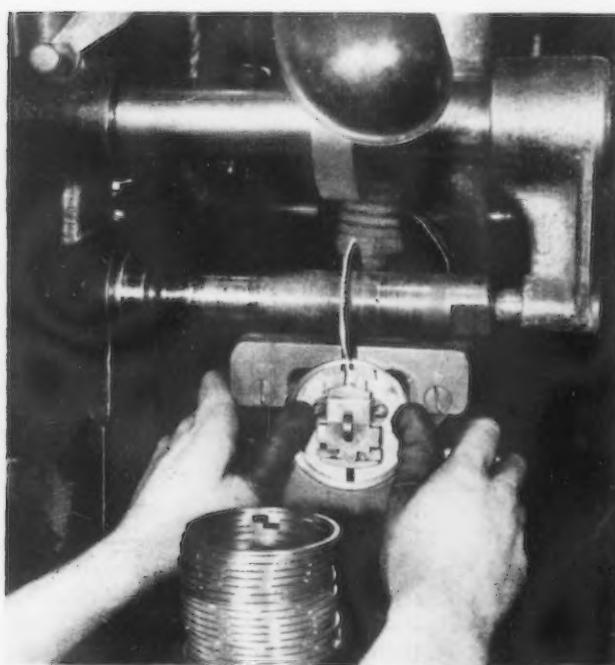
The Arter Grinding Machine Co. was the builder of the grinders for the finish-edge operation. These machines are equipped with magazine feed to magnetic clutches, one face of a ring being ground at a time. After finish-grinding, the rings are inspected 100 per cent for machine defects (quality of finish and size)

and foundry defects (sand holes), thus saving time which would otherwise be lost on subsequent operations.

The first cut of the joint is a milling operation, using two thin cutters to which two rings at a time are fed by hand. Beginning with this operation barrels are no longer used, but instead metal tote boxes, which are mounted at an angle on roller floor stands. Overhead, throughout most of the shop is a monorail system.

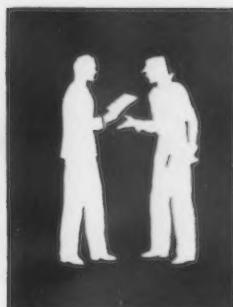
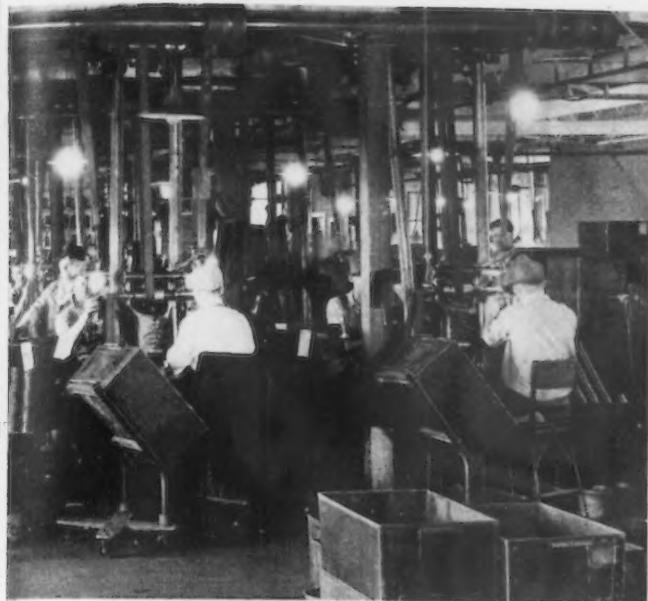
Rough face turning, like all other inside and outside turning operations, is interesting because of methods used to remove metal under conditions that permit the rings to assume their true circular shape when installed in an engine cylinder, thereby exerting equal radial wall pressure. From 18 to 24 rings are first closed with a split pot in an air vise. The air pot is a rubber-lined cylinder that fits over the arbor on which the rings are mounted. When air pressure is applied the ring joints are closed and the rings take a natural unstrained position on the arbor. They are clamped in this position for rough and finish turning the outside surface. For inside boring the rings are compressed in an air-operated pot and put in a holder sleeve. They are then released so the rings take their proper shape for boring. The amount of metal removed in the boring operation determines the tension of the rings. Tests for tension are made after this operation.

JOINTS are sized on a miller. The ring is compressed to size in a special fixture.



Two Operations Performed at One Lathe Mounting

Rings are now ready for grooving and slotting operations. They are first placed in a pot so that the cuts



All of the operations here described are performed on 4,000,000 rings a month when running at capacity.

Soy Bean Oil for Cores

AN investigation of the suitability of soy bean oil either as a substitute for, or a diluent of, other oils used for making cores was conducted by the Engineering Experiment Station of the University of Illinois, Urbana, Ill. Results are published in Bulletin No. 235.

Some of the conclusions follow: Raw soy bean oil produced cores with an average tensile strength slightly higher than the average tensile strength of cores made from semi-refined or varnish soy bean oil. The addition of kerosene to raw soy bean oil caused a gradual reduction in the average tensile strength of the cores as the percentage of kerosene in the mixture was increased. The addition of Japan drier to raw soy bean oil slightly increased the tensile strength of the cores. Various additions of both Japan drier and kerosene to raw soy bean oil produced cores with varying tensile strengths which followed no definite rules over the range of data collected. Cores made with various proportions of linseed oil and soy bean oil were as strong as those made with linseed oil. Cores made with mixtures of linseed oil, kerosene, and soy bean oils decreased in strength as the percentages of kerosene and soy bean oil were increased. The tensile strength of the cores made with the soy bean oils, and mixtures of soy bean oil and kerosene, was found to be proportional to the iodine numbers of the soy bean oils and mixtures of soy bean oil and kerosene.

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on the diameter are in line. They are then clamped in this position by an air fixture in a lathe that has milling cutters mounted on the front and on the back of the tool carriage. The endless channel is first cut in the outside edge. The channel cutters do their work when the mandrel is rotating. When the channel is finished these cutters back away. The lathe spindle stops rotating and the rotating slotting cutters are advanced. When a slot has been cut, the cutters are backed out and the mandrel is indexed to the position of the next slot.

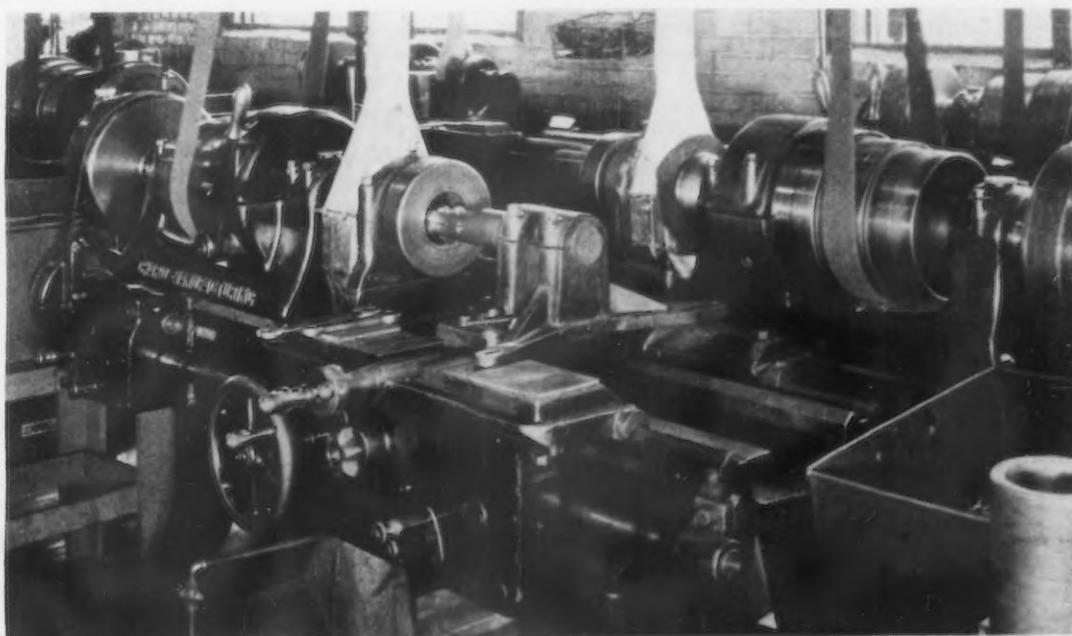
Then the rings are compressed in a fixture and a final milling cut is made to size the joint. The final outside turning or clean-up operation is performed on a lathe. For this op-

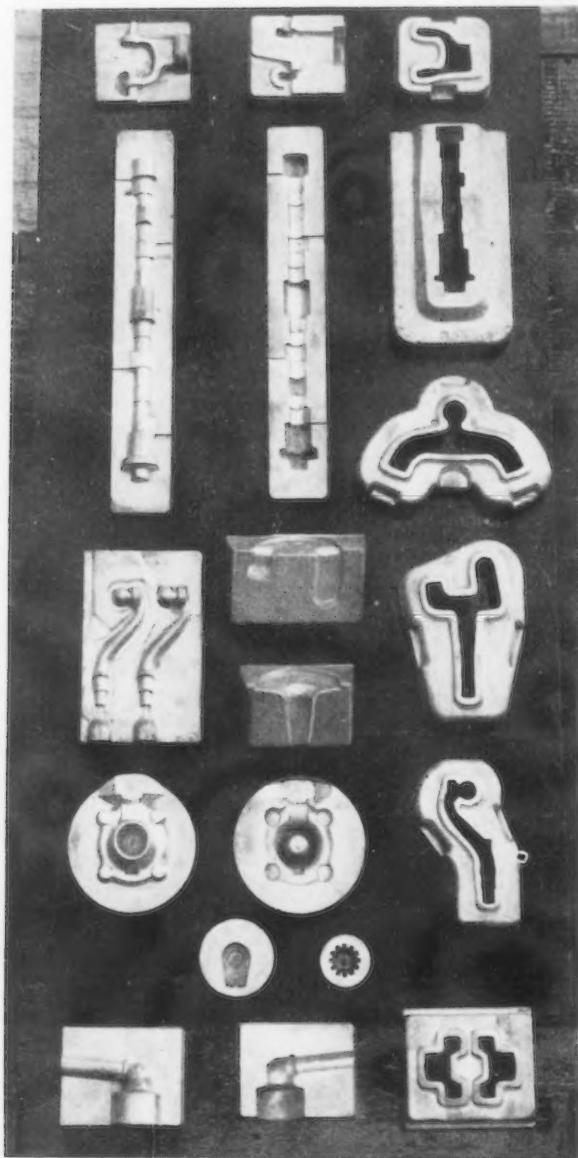
eration the joints are placed in line (considering oil-regulating rings only) and a special pot is used to bring the rings to proper shape before taking a very light cut. All rings are then air blown before final inspection.

An outline of inspections is as follows: There is a 100 per cent inspection after finish grinding to disclose all defects. In addition, there is a percentage inspection on the floor after each operation. Final inspections are as follows:

100 per cent visual
Percentage for circularity
Percentage for tension
Percentage for flatness
Percentage for face contact
Percentage for hardness (Rockwell)
Percentage for width
Percentage for joint clearance

RINGS are compressed in an air-operated pot and put in a holder sleeve for the inside boring operation. Metal removed determines the tension of the rings.





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LARGE savings in the making of forging and trimming dies have resulted from the development by the Ford Motor Co. engineers of a process by which a hardened master die is driven into a heated block of steel, much as a signet ring is used to make an impression in wax. This process, which for the want of a better name has been called "die typing," has been developed to such an extent in the Rouge plant at Dearborn, Mich., that many parts for the car are now forged or trimmed by these new-type dies.

Dies are one of the most important items in the cost of making automobiles. Extensive use of forgings in the Ford car and truck has necessitated maintaining a large staff of skilled mechanics to repair and replace worn-out dies—an industry of no small proportions in itself. Of course, a considerable staff is still maintained, but the production of dies

has been increased tremendously by the typing method. Accuracy is maintained and the forging dies are found to give somewhat longer service.

Small Dies Typed in Mechanical Press

Some of the smaller dies are typed in a punch press with a capacity ranging from 400 to 600 tons. To type the die for the steering gear sector, for instance, it is necessary to make a type with projections of the same shape as the impression desired in the dies, although enough larger than the die to be typed to allow for the shrinkage that will be encountered when the typed die cools. Pieces of steel of suitable size are heated to a temperature of 1700 deg. F. in a lead pot. One of the heated steel blocks is placed in a retaining ring and pushed into place directly under the master type which is mounted in the ram of

"TYPING" PROCESS



the press. The master type is forced into the heated billet.

Some parts, however, as, for instance, the star punch for the gasoline gage nut, require a somewhat different process. In this case the master type consists of a ring with a star impression worked out in the center just enough larger than the punch required to allow for shrinkage. This is placed on the bed of the press and a flat piece mounted in the ram. When the billet is put in place and the press tripped, the billet is driven into the master die.

Steam Hammers Used on Large Dies

On the larger dies, such as Ajax dies, trim dies, forging dies, etc., a 2500-lb. steam hammer is used. The type consists of a set of hammer die blocks. In the bottom block a cavity is machined to approximately one-half of the thickness of the die to be made. The top block is machined in a similar manner, except that the cavity is in the bottom of the block. The cavities retain the heated metal and cause it to flow up and around the master, filling in sharp corners and various intricate places. In some cases when difficulty is experienced in filling corners or small projections in the dies to be typed, it is necessary to drill vent holes in the master die, thus permitting the gases trapped to be compressed in these vents without retarding the flow of metal.

Ordinarily on these type dies, billets are heated to a temperature of 2100 deg. F. It is essential that the temperature be the same for all dies typed in any one master, as this master is allowed to accommodate a certain shrinkage. If the temperature is allowed to vary, dies will not be of uniform size.

Billets Ground to Eliminate Scale

Another very important factor in typing dies is the control of the atmosphere in the heating furnace and

ESS OF MAKING FORGING

DIES LOWERS FORD COSTS

the protection of billets when heating. Since the dies require no machining, scaling cannot be permitted. The Ford method of avoiding scaling is to grind one side of the billet to insure that all decarburized material, which might have resulted from rolling or forging temperatures previously employed, has been removed. Fine charcoal or other material, such as cast iron chips, is placed on the die immediately after typing to keep down oxidation.

In the case of large hammer dies, such as connecting rod dies, camshaft dies, steering arm dies, etc., it is much easier to type inserts and fasten them to larger blocks to make the die blocks.

Forging trim dies are also typed to great advantage. The openings in these dies are typed so accurately that the only work necessary to finish them is a few strokes with a file to accommodate the "wear in the forging dies" and to shape the bottoms.

Some idea of the savings effected by the die typing method can be gained from the Ford production records. For instance, one crew of two men can type 80 die inserts for connecting rod forging dies (40 sets) in 8 hr., whereas it is estimated that from 26 to 30 hr. are required to sink one set of rod dies by the conventional method. A certain set of trim dies required 15 hr. by the old method and only 18 min. by the new. A ball seat punch die took 15 hr. by the old method and 15 min. by the new.

Typed Dies Have Long Life

On top of that, the productive life of typed dies is about 25 per cent longer than cut dies on forging and upset work and equal to cut dies on trimming work. This, according to the Ford metallurgists, is due to the fact that the grain of the steel on the surface of typed dies is more dense and the fibers are flowed to accommo-

CALLED "die typing," the new process here described has greatly reduced the time required to produce forging and trimming dies at the Rouge plant of the Ford Motor Co. In this process a hardened master die is driven into a heated block of steel, and the "types" used to form the dies are themselves made by the same typing method. From one master die Ford is able to turn out 500 to 1000 types, from each of which 200 to 800 dies can be produced.

date the shape of the impression in the die, whereas in dies made by the conventional method the ends of the

grain are exposed to the continuous strain of the hammering.

It is interesting to note, too, that the types used to form the dies are themselves made by the same typing process, so that from one master die Ford is able to make from 500 to 1000 types from each of which 200 to 800 dies can be made. This method is used where a great number of the same kind of dies are consumed and the replacing of the typing master becomes frequent. When this is done, a set of master hammer dies is made which resembles the dies that are ultimately to be made, but which differs in that the dies are three shrinks larger than the car part which is to be produced. One shrink is used when the type is made, another when the type is used to make the die, and finally the last shrink in making the car part.

Impact Value of Rails at High Temperatures

CHARPY impact tests at elevated temperatures on a number of rail steels, recently completed at the Bureau of Standards, showed that the phenomenon of secondary brittleness was marked for all rail steels tested, and also was found in 0.60 per cent carbon steel bar stock on which tensile tests had shown no secondary brittleness.

The reduction in the amount of energy absorbed by the notched specimens, when broken under impact in the secondary brittle range, had been considered by some investigators to be the phenomenon of blue brittleness occurring at higher temperatures in an impact test than in a tensile test, but the results of these tests, when

compared with the tensile results for the entire temperature range (20 to 700 deg. C.), indicated that the decrease in the amount of energy absorbed is a manifestation of the phenomenon of secondary brittleness.

A more complete account of this work was published in the February number of the Bureau of Standards *Journal of Research*.

The revised simplified practice recommendation covering forged tools is now available in printed form, according to Division of Simplified Practice, Bureau of Standards. Several items are included in the revised recommendation to meet railroad requirements and other consumer demands. Copies of the book can be obtained from Superintendent of Documents, Government Printing Office, Washington, for 15c. each.

PULVERIZED COAL SYSTEM SERVES

A COMPLETE pulverized coal system for firing melting furnaces, annealing ovens and boilers was installed last year in the malleable iron and Promal foundry at the Ewart Works of the Link-Belt Co., Indianapolis. From the time of its receipt at the plant until it enters furnace or oven the coal is mechanically handled. Electric signaling and electric control feature the distribution of the pulverized coal to the fur-

nace storage bins. The entire system is dust-tight. All smoke from opening of fire doors is therefore eliminated.

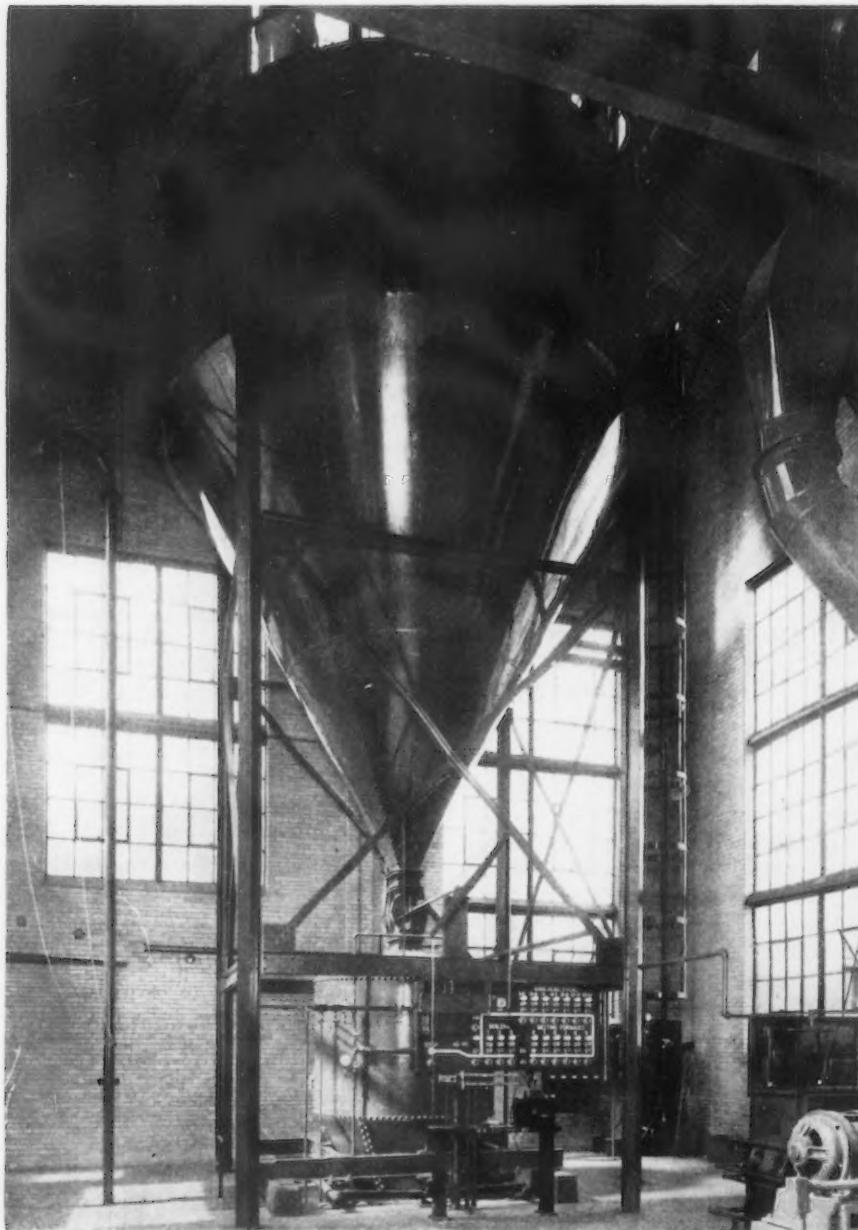
The system was put in without interruption to plant schedules. The present capacity of the coal preparation plant is sufficient to permit adding more ovens or furnaces as production increases. The system is so designed and arranged that future additions can be made without disturb-

ing the main coal distributing line or losing any part of the existing equipment.

Let us follow a lump of coal from its receipt at the plant to the firing line. The incoming car is spotted over a receiving hopper underneath the switch track and the coal is dropped into this hopper. From there an inclined steel apron conveyor carries it to the Link-Belt double-roll crusher in the preparation building alongside the track. This crusher has a capacity of 36 tons per hour. The apron conveyor is equipped with a magnetic head pulley to take out the tramp iron before coal enters the crusher.

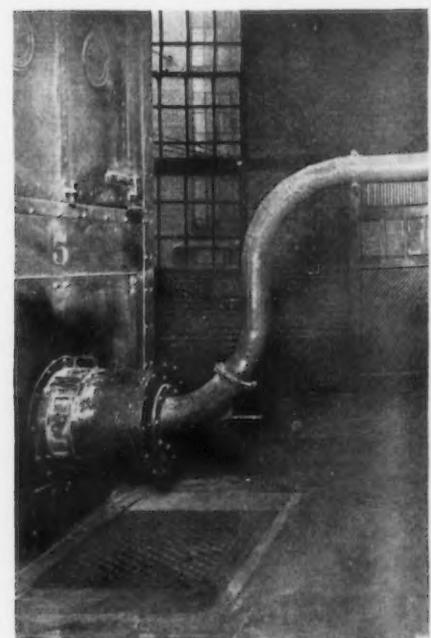
The crushed coal, reduced to 1½-in. lumps, drops into a Link-belt bucket elevator, which carries it to a concrete storage silo of 700 tons capacity, shown in the illustration.

From the silo the coal is fed by a gravity chute into the pulverizer or



Corner of the pulverizing plant showing 60-ton signal board and 4-in. diameter

Coal, after delivery at the plant, is crushed and silo. Coal preparation plant is to



Three-ton pulverized coal bin, screw feeder for firing

USES FOR BOILERS, OVENS AND AIR FURNACES

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By FRANK S. O'NEIL

General Manager, Ewart Plant,
Link-Belt Co., Indianapolis

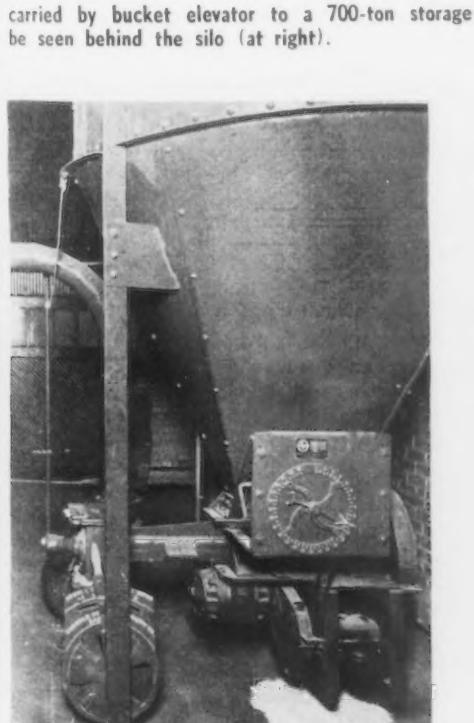
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"kiln roller mill," where it is pulverized and dried at the same time. With the kiln mill no separate dryer is required, thereby reducing the cost of the preparation equipment and subsequent operation. Air for drying the coal in the pulverizer is heated in a separate oil-fired heater and enters the pulverizer at 300 deg. F. This gives a temperature of from 110 to 150 deg. F. in the pulverized coal discharge pipe. Automatic control is provided so that the heater is shut off when the air reaches the desired maximum temperature. This can be regulated to suit conditions. The excess air used for drying passes through a cyclone collector at the top of the pulverizer for cleaning and is discharged outside of the building. Because of the use of air separation the desired fineness is easily maintained.

Fuel Weighed Before Distribution

Distribution of dry pulverized coal to the various furnaces and ovens is

powdered coal storage bin, 5-ton blowing tank, conveying line (at left).



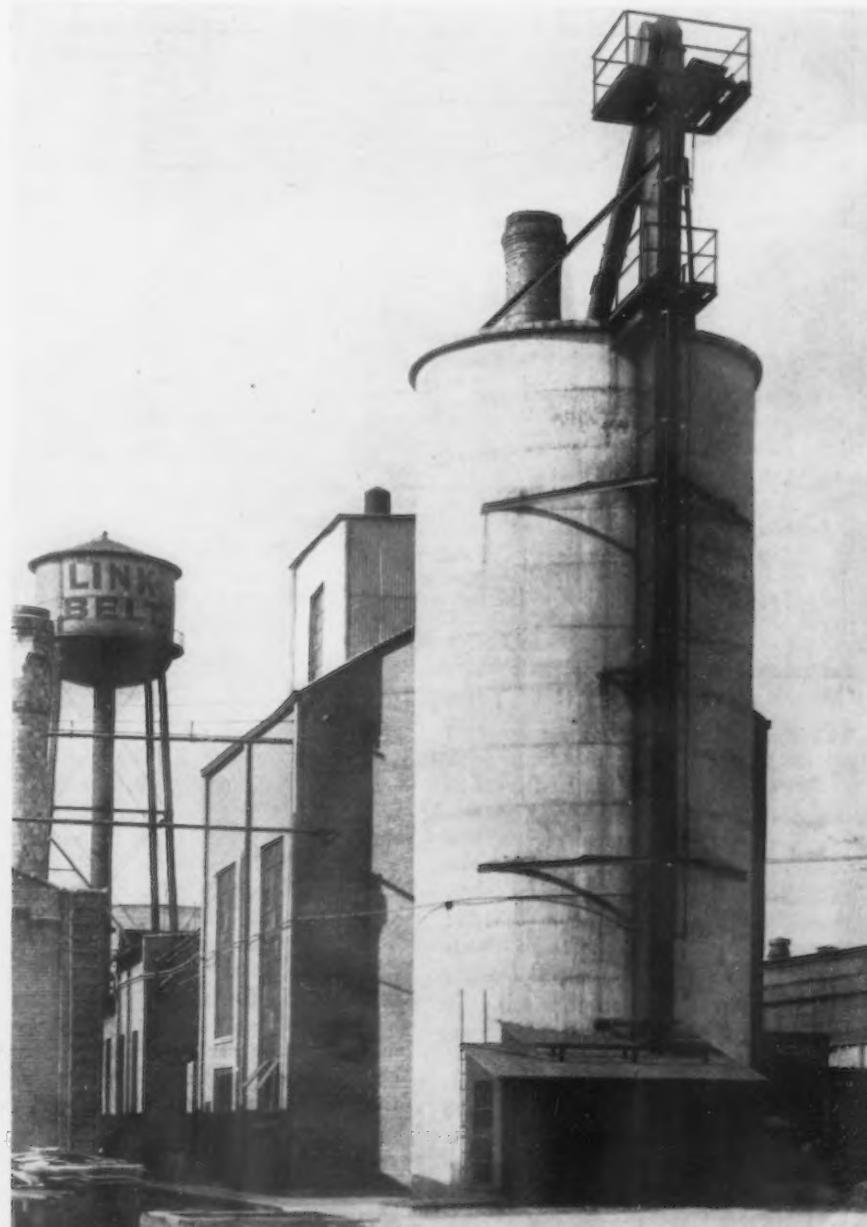
screw feeder
for firing
boiler (above).

made by means of a pneumatic conveying system controlled from a central signal board at the main storage hopper. The coal is conveyed through 4-in. standard steel pipe, direct to the various units to be fired.

Before dispatching it to the furnaces the coal is fed into a 5-ton weighing tank mounted on a scale with weightograph attachment which accurately records the amount of fuel used.

A dust-collecting line, parallel to the conveying line, removes the fine coal dust, which is carried off by a cyclone located at one of the furnaces.

To illustrate the automatic operation of this system, assume that coal



is needed for furnace No. 1. The furnace attendant pushes an electric button and immediately a colored light appears on the central signal board, telling the operator that coal is desired at No. 1 furnace. The operator then presses a button which releases the switching valve by pulling a pendant chain. Automatically a different colored light flashes on the central control board, informing the operator that the valve at No. 1 is open, ready to take coal from the main feed line.

if the manhole cover is not properly sealed. The entire transport system is worked out for automatic operation and perfect control, avoiding any possibility of overfilling the hoppers or spilling the coal. Everything is absolutely dust-tight and safe. The cost of transporting coal by compressed air averages 6c. a ton.

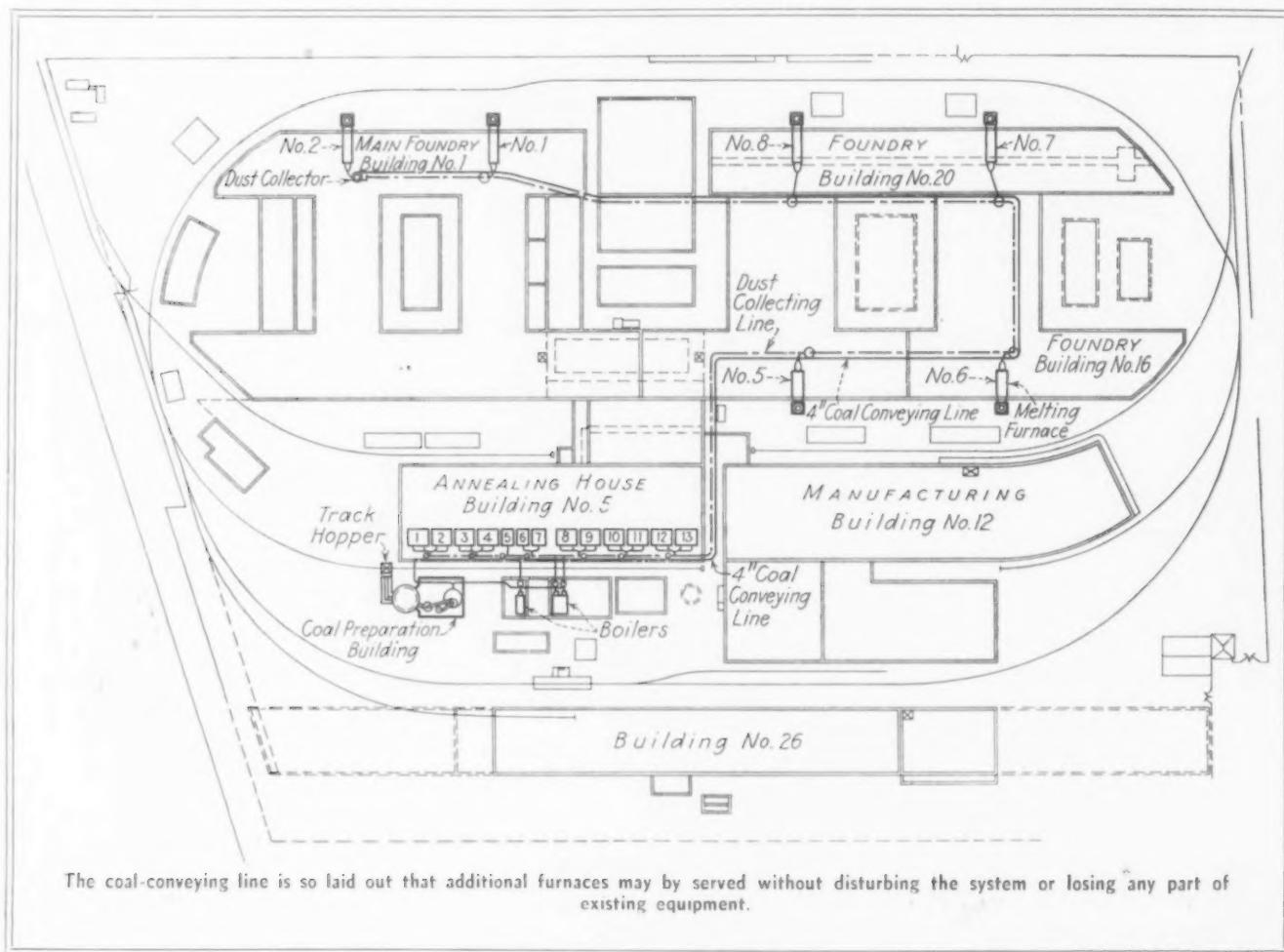
Valves Give Close Adjustment of Air

Returning to No. 1 furnace, we find the hopper filled with coal ready for

refuse; in the boilers it is deposited on the bottom of the furnace and has to be removed occasionally the same as with hand firing, only not so often.

Three Types of Burners Used

Three different styles of burners are used. The melting furnaces are all equipped with stream-line burners, which give a low-velocity flame required for metallurgical melting. The annealing ovens are all equipped with high-low velocity burners which give



The coal is conveyed by compressed air (15 to 35-lb. pressure) and, as soon as it reaches a predetermined level in the storage bin at the furnace, an automatic limiting device closes the valve and stops the coal flow. At the same time a third light flashes on at the central control board to tell the operator that No. 1 furnace has been supplied.

The system is so interlocked that the switching valves for drawing coal from the main line cannot be opened by the pendant chain until the operator at the central control board has released the valve. The safety manhole cover on each individual storage hopper is also interlocked so that no coal can be conveyed into the hopper

operation. A screw feeder attached to the bottom of the hopper feeds the coal at the desired rate, positively controlled by a Link-Belt P.I.V. variable speed transmission, for combustion. As the pulverized coal enters an exhauster it is picked up by the air stream and delivered to the burner. Here the air and coal, in proper proportions, are thoroughly mixed and blown into the furnace. Valves are provided that give a close adjustment of air and permit precise control of combustion. This completes the cycle of operation.

Only a small amount of ash is formed when burning pulverized coal. In the case of the melting furnaces, this goes off with the slag and other

a flame of variable length—a short flame for starting and a long flame for bringing up the front of the ovens and holding an even temperature. Each of the three 20-ton ovens has one burner; the ten 35-ton ovens are equipped with two burners each.

The three 200-hp. horizontal return-tube boilers used for heating the entire plant are equipped with the turbulent type of burner, which gives a short, hot turbulent flame suitable for this class of work. The secondary air for combustion is controlled by an air gate with atmospheric intake.

Aside from the convenience of automatic controlled operation, this system is making very definite savings in both labor and materials. On the an-

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nealing ovens, for instance, several hours have been cut off the cycle of operation. Because the temperature throughout the entire oven is uniform, castings can be placed in any part regardless of size and come out thoroughly annealed. There is a very marked saving in fuel cost. Formerly, with hand firing, these same ovens required 752 lb. of fuel per ton of castings annealed; now, with pulverized coal, the consumption has been brought down to an average of 500 lb. per ton.

A number of economies have been effected on the melting furnaces. The elimination of hand firemen is a big item. A higher percentage of good castings and more uniform analysis of iron are an important result. Very hot fluid iron is obtained, 2700 deg. F. and above, at the spout. It is also found that the iron retains its temperature in the ladle longer than with hand firing. Ninety per cent of the heats so far have come out minus or plus five points in carbon. Less oxida-

tion and less wear on the furnace lining are other items; also a better ratio of coal to iron.

On the boilers, which are operated only for heating the plant, there is the double saving of labor and fuel and the advantage of a more easily controlled heating plant.

The system was installed by the Grindle Fuel Equipment Division of the Whiting Corp., Harvey, Ill. Photographs are published by courtesy of that company.

Guide Posts for the Business Organization

AN array of injunctions for the guidance of the business administrative executive was a central feature of an address given recently before the Chamber of Commerce of Rochester, N. Y., by Harold V. Coes, manager of the industrial department of the New York engineering firm of Ford, Bacon & Davis, Inc. Many of these virtual precepts are listed immediately below as a basis for directing attention to each important item that needs to be taken into consideration in appraising or improving the condition of one's own industrial enterprise.

Markets and Marketing

Determine what the consumer wants, where he wants it, in what quantities and at what price.

DETERMINE (from suitable costing methods and research) the relative profitableness of products or lines, the products to be retained and pushed and those to be eliminated.

Determine the territories to be developed and those in which operations should be curtailed or suspended, or less expensive agencies of distribution substituted.

Analyze the pricing and discount policy with a view to developing sound means for setting, establishing and regulating prices and discounts, keeping adequate comparison of costs and prices.

The Company Organization

Set up an economical, logical organization, one best suited to the business. Distinguish between line and staff functions and positions. Select the personnel based on the qualifications imposed by the duties to be performed. Promote a sound understanding throughout the organization of the duties, responsibilities, authority and function relationships.

Establish standards of management using cost records and the budgets

to check performance against the standards.

Beware the evils of over departmentalization, a most expensive form of organization and administration in too many cases.

Develop a sound plan for incentives for executives in addition to properly established base salaries; incentives that are equitable both to the stockholders and to the employees, yet adequate as a means to bring about that necessary and desired degree of cooperation between departments, between executives and between line and staff officials.

Set up suitable means for effective control of raw, in process and finished materials and goods, predicated on established standards of turnover and budgeted amounts—to result in release of working capital and its more effective use.

Establish a planning department to plan production in consonance with sales, to regularize production, provide adequate service to the customer and permit the operating executives to work to a plan, execute it and attain the predetermined objectives.

Review the depreciation and dividend policy, and establish a policy that will prevent diverting funds for renewals and replacements to divi-

dends and establish a sound conservative dividend policy.

Financial Policies

Establish a sound policy of equipment replacement, setting up an equipment replacement reserve fund from the depreciation charged into the cost of sales.

Determine the equipment and facilities that are now obsolete and plan for their orderly replacement.

Ascertain the extent to which idle assets are influencing production costs or selling prices. Idle capital and assets must do without return under present conditions. Determine the true costs on the basis of the actual assets actively employed and required in the business.

Establish sound and equitable base wage rates and set up an economical, readily understandable wage incentive system, one best suited to the type of business, its traditions, and the character of the workers,—to result in lower production costs.

Study employment stabilization methods, adopt such a plan and develop such methods as the present state of the art and circumstances will permit to regularize employment and protect the stable employee.

Review production costs for materials, labor and overhead, with a view to substitution of material, elimination of waste of material and labor, better layout to reduce handling, better handling methods, better and lower cost processing methods, elimination of unnecessary overhead, and the elimination of obsolete equipment and methods.



HEAT TREATING IMPORTANT LINK IN

By HERBERT R. SIMONDS

METALLURGY, heat treating and plating are all closely linked in the manufacturing sequence of Wasp and Hornet engines. The various types of steels used for the different parts and the corresponding heat treating cycles have been carefully developed and standardized. Plating is extensively used for three purposes: to assist in detecting cracks, to keep certain surfaces soft for machining and to prevent freezing between close fitting similar surfaces. So far as is practical, standard S. A. E. steels have been specified for all steel parts. S. A. E. 2512 steel is used on important carburized parts such as cam rings, front crankshafts and case hardened gears. S. A. E. 3140 steel is used for the master connecting rods. S. A. E. 6150 steel is used for piston and knuckle pins, nuts, studs, bolts and for all gears except those which are case hardened.

Most of these steel parts are forgings which, although made up by outside firms, are carefully specified as to grain flow of the metal under the hammer. This is to give high working strength to the thin sections which are required to keep the engine weight as low as possible. The piston pins are

HEAT treating is apt to be considered an auxiliary or outside operation in the manufacture of finished steel products. This point of view leads to material handling inefficiencies in the heat treating department which would not be countenanced in the machine shop. Such inefficiencies are not serious perhaps when one or two pieces only of a multi-piece assembly are tempered. But they become serious when heat treating is specified for nearly all parts as it is in the construction of airplane engines. Many improvements in the handling of material through the heat treating department of the Pratt & Whitney Aircraft Co., Hartford, Conn., are described in the accompanying article. In this case the company has considered its heat treating as an integral part of its production sequence and has raised operating standards accordingly.

made from tubing. Formerly they were machined from solid bars, but the tubing has been found to have a more satisfactory grain flow and to require less time for machining. The parts now made from the tubing have the same strength as those formerly made from bar stock. The metal used in the master rod bearing is composed of 70 per cent copper and 30 per cent lead and when used on a carburized

crankshaft bearing surface gives more satisfactory results than the usual babbitt metal.

Handling Reduced in Hardening Room

Great care has been taken in designing and equipping the heat treating department. All furnaces are electrically operated and automatically controlled. Such features as width

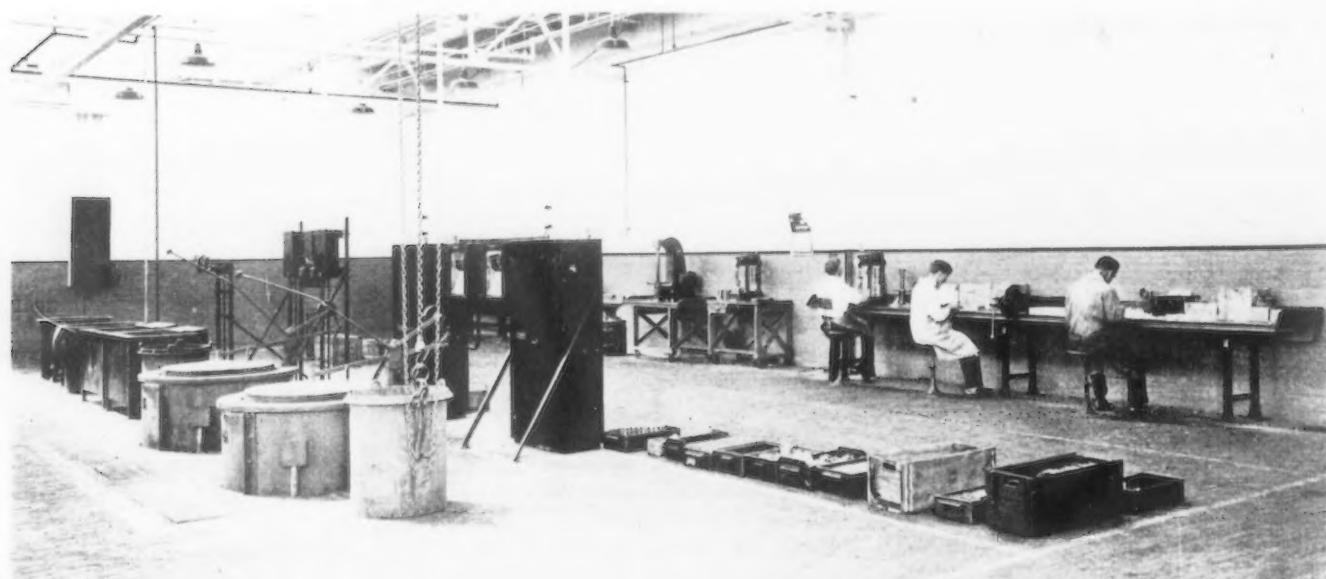


FIG. 1—The neat condition of the heat treating department is an established practice and not just for the picture. The Homo furnaces seen down into the floor for convenience in loading are shown at the left.

INK IN AIRPLANE ENGINE CONSTRUCTION



of doors, height of hearths and location have been studied from the material handling standpoint. Recording pyrometers have been installed in connection with the principal furnaces to give continuous charts of the heating cycle. The neat condition of the department may be seen from Fig. 1, which shows electrically operated Homo furnaces set in the floor at the left and the inspection benches at the right. The low position of the Homo furnaces is for convenience in loading and unloading. The top of the furnaces is level with the platforms of the standard trucks.

Experience has shown this to be the best arrangement even though the usual method of charging is by means of cylindrical containers swung from the trucks and lowered into the furnaces by an overhead trolley. The quenching tanks, which are all located close to the furnaces, are supplied with oil at room temperature by a continuous circulating system and a cooling tower. A typical quenching tank with its piping and overflow is

shown in Fig. 4. The furnace in this case is used for tempering small parts.

Handling of material through the heat treating department has been carefully arranged to give a minimum of lost motion. The trucks which are used to transport material to the large furnaces are all of standard design, with platforms at the same height as the furnace hearths. An interesting detail in the design of these standard trucks is found in the platforms, which, instead of being made of steel plates, as is the usual case, are built up of narrow perforated channels set

flange to flange with the smooth side uppermost. This avoids warping under the effect of high temperature and greatly increases the life of the trucks. Fig. 2 is a closeup view showing part of one of these trucks and giving details of the channel construction. The loading of the pots into the annealing furnaces has been skilfully worked out to make it a one-man job. Pots on a truck in front of a furnace ready to be charged are shown in Fig. 5.

These, which are of special design, are held a short space above the truck platform by narrow lugs which en-

FIG. 3—By keeping accurate control of the various factors in the plating department substantial savings in labor and materials have been made.

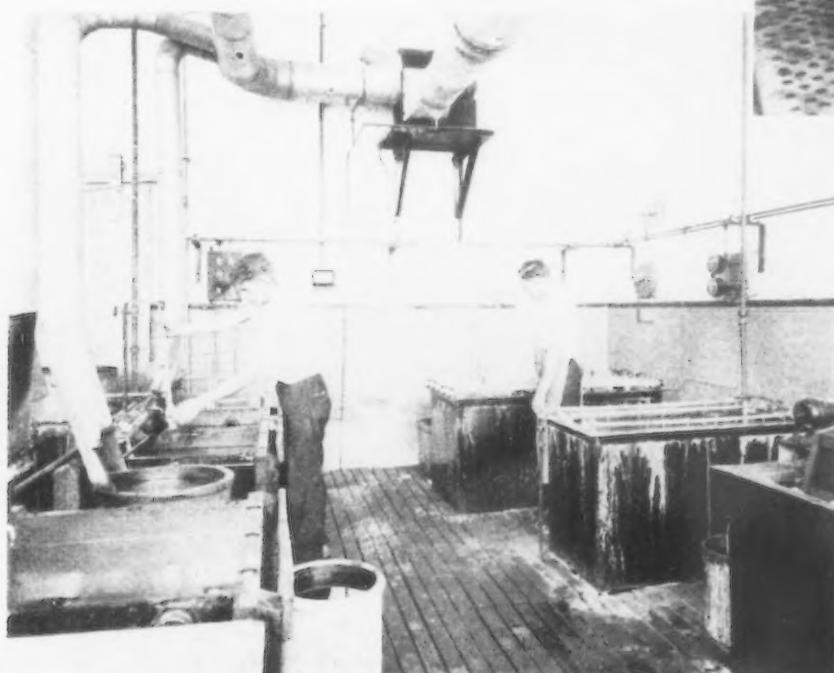
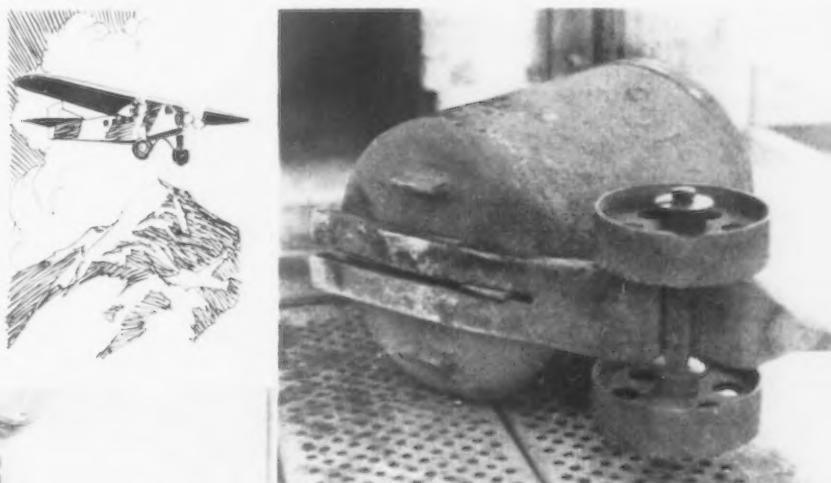


FIG. 2—One of the annealing pots is here tipped over to show the method of lifting it with a dolly charger.

able the operator to slip the arm of a dolly charger in under a pot and in this way lift it up and roll it forward into the furnace. A slot in the dolly arm slips over two of the projecting lugs and thus steadies the pot while it is being pushed back in the furnace. Fig. 2 shows a pot and dolly charger tipped over to demonstrate the design of the lugs with the charger in position for lifting. The actual method of charging is better shown in Fig. 6. Here a long handle is used to make it possible to place the pot at the rear end of a deep furnace. The various curves in the handle may appear accidental, but in reality they form a vital part of a

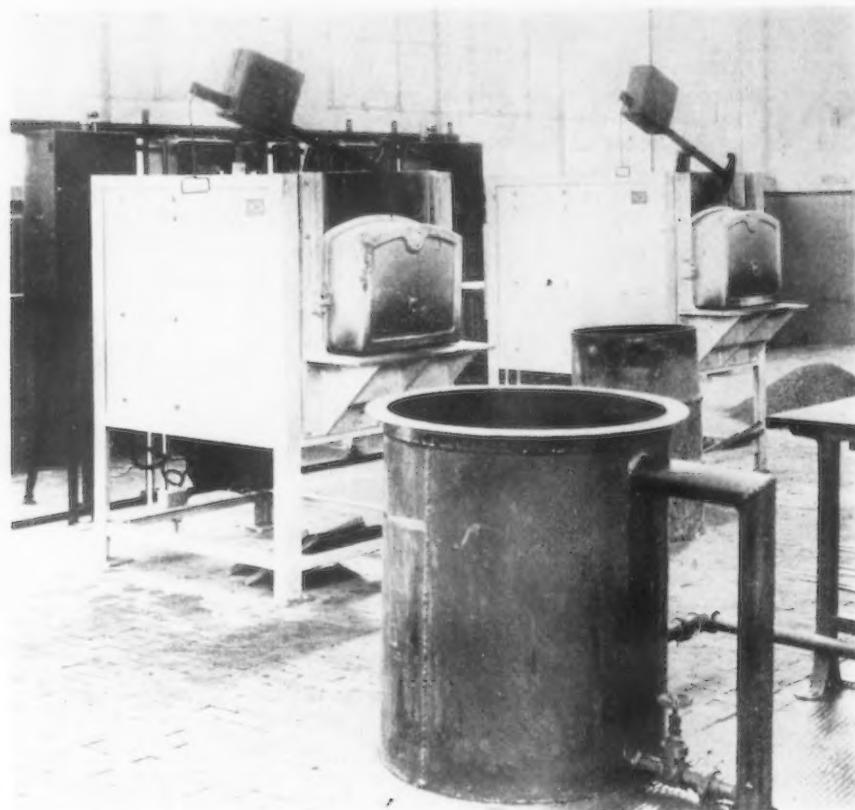


FIG. 4—An individual welded quench tank is located close to each furnace. The oil for quenching is kept at room temperature by a circulating and cooling system.



FIG. 5—Trucks in the heat treating department have platforms at the same level as the hearths of the furnaces which they serve.

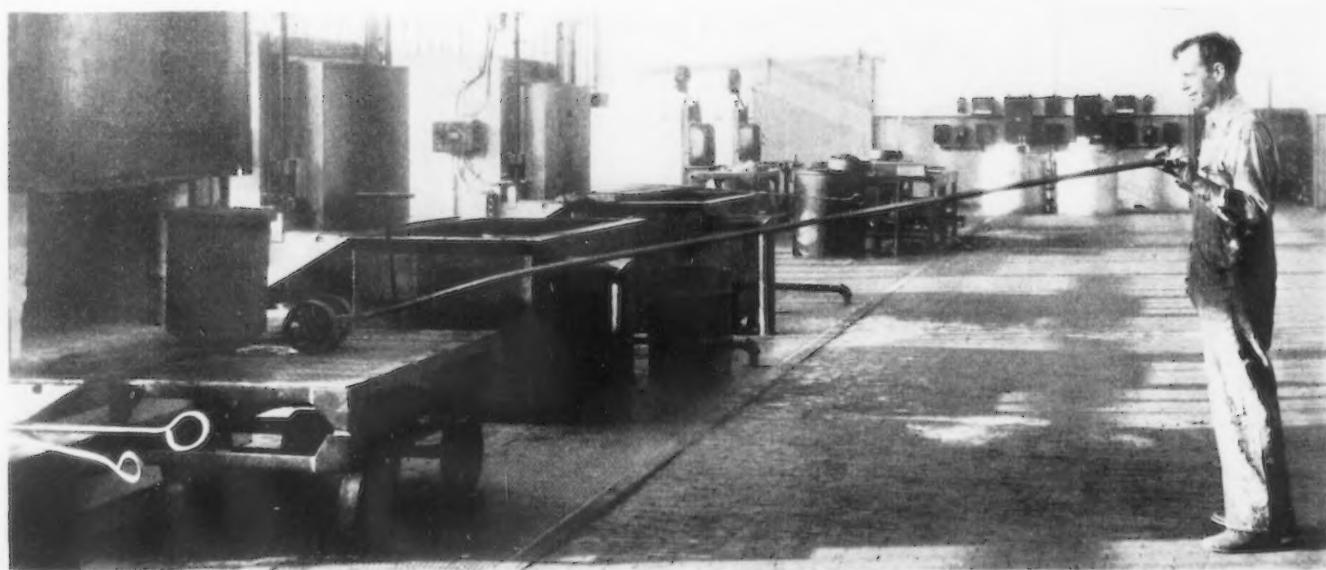


FIG. 6—The curve in the long handle of the dolly charger is an important part of the design which makes it possible for the operator to lift up a pot and place it at the rear of the furnace.

design which permits one-man operation.

Parts to be heat treated enter the department from the machine shop through one door and then, after completing the tempering circuit, leave by another door to again take their place in the machining sequence. The shop order which accompanies each group of similar parts into the heat treating room contains the steel analysis of the parts and the corresponding definite temperature schedule for the tempering. In the case of the cam ring mentioned, a hardening heat of 1450 deg. F. is used. Quenching is in oil at room temperature and the draw temperature is 350 deg. F. Piston pins, which

are S. A. E. 6150 steel, are hardened to a Rockwell of 50 to 53 by heating to 1620 deg. F., then quenching in oil and drawing at 550 deg. F. Carburizing is usually at 1650 deg. F.

Plating Economies Made

The plating room adjoins the heat treating room and it also is an example of efficient design and operation. Many pieces are copper plated on certain areas only to insulate such areas from the case hardening and to thus keep them soft for subsequent machining. The usual method of coating a part of the surface of a piece is to first copper plate the entire piece and then machine the surfaces

which are to be hardened. Some manufacturers have reported difficulty in getting a thin copper coating to adequately protect against hardening. The technique of copper plating is one of the hobbies of Henry Fischbeck, metallurgist at the Pratt & Whitney Aircraft plant. He has found that by carefully regulating the plating process he is able to secure proper protection with a coating not over 0.001 in. in depth. This is from a half to a fourth the depth of the copper coating felt necessary by some manufacturers. By being able to use such a thin layer of copper, Mr. Fischbeck has been able to show marked economies in time and material.

World's Largest Testing Machine Applies Loads Up to 3,000,000 Lb.

THE world's largest testing machine has just been completed in the shops of Baldwin-Southwark Corp., Eddystone, Pa., and shipped to the University of California, Berkeley, Cal.

It is able to test columns up to 33 ft. 6 in. long in compression and up to 4,000,000 lb. load. In tension it accepts specimens up to 33 ft. 6 in. diminished by machine stroke and will apply loads up to 3,000,000 lb. The spread between the columns is 10 ft. and the table is 12 ft. long. Since the table is level with the laboratory floor a truck may drive between the columns and the specimen be lifted directly from the truck body by the testing machine itself.

Table of Machine Stationary

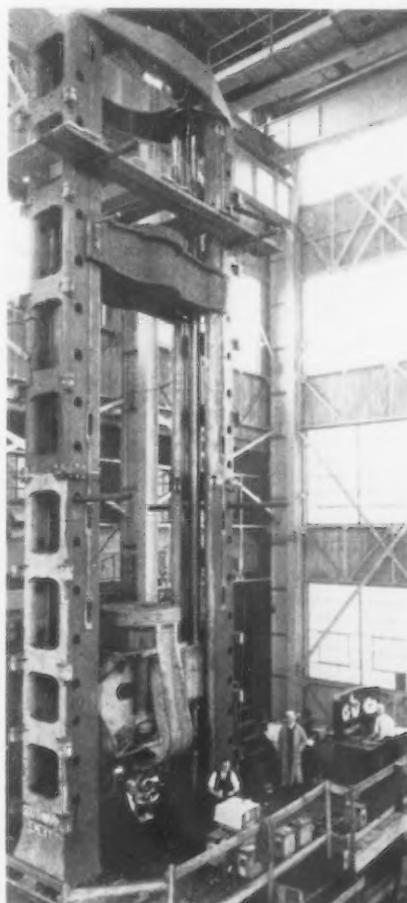
The table of the testing machine is stationary, being secured directly to the foundations. The ram is fastened to this table. The cylinder, therefore, is the movable element and to it is fastened by lug extensions two vanadium steel screws 12 in. in diameter, 56 ft. 8 in. long, threaded double $\frac{1}{4}$ sq. threads per inch. By means of long bronze nuts which are bedded in the lower cross-head (which carries also the weighing system and, in a yoke, the lower grips for tension testing) the loads are transmitted from the screws to the cross-head. The purpose of the threads, however, is not to produce the load as has been the practice in some types of testing machines. During loading there is no movement of nut and screw relative to one another. The function of the screw and nut is to raise or lower the lower cross-head so that the space available for testing may be changed to accommodate the specimen to be tested. Compression tests are carried out be-

tween the lower cross-head and the table, while tension tests are made between the upper cross-head and the yoke around lower cross-head.

This machine stands 46 ft. 9 in. above the floor line and the foundations to about 25 ft. below. The depth of the pit is 19 ft. Total weight on

the foundation is about 475,000 lb. Because the height of the machine above the floor is equivalent to more than that of the third floor of an average building, provision has been made for the application of an elevator. This permits the presence of assistance at any level for extensometer readings, for examinations of the specimens, or for inspection of the grips.

One of the unusual and unique features is the highly refined control which is incorporated. Devices are mounted for maintenance of constant load over an indefinite period, devices for application of load at constant rate of load increment, start, stop and inching buttons for motor control, limit switches for safety and cut-outs for these specific conditions. A Telechron clock and indirect lighting for the gages as well as pilot lights for motor circuits are unusual refinements.



Installation of the first X-ray machine for commercial use in a shipyard is announced by the St. John X-Ray Service Corp., 505 Fifth Avenue, New York. This equipment has been installed in the plant of the Sun Shipbuilding & Dry Dock Co., Chester, Pa. Though primarily designed to meet the requirements of the American Society of Mechanical Engineers boiler code for welded pressure vessels, it can be used just as well on any other welded construction and for the examination of castings and forgings. Besides its regular use in the plant, special arrangements have been made by the Sun company to handle outside work.

COPPER-BRAZING APPLICATIONS

By H. M. WEBBER

ONE manufacturer in Detroit, the Bundy Tubing Co., has recently introduced a new steel tube which is fabricated by the copper-brazing process. This product is similar to the sweated tubing manufactured from steel, copper and brass by the same company. All of these tubes are made by laterally rolling a steel strip into a double-walled structure. The copper-brazed steel product, called Bundyweld tubing, is fed continuously through a controlled atmosphere furnace, and the copper, which is applied locally to the joint, flows uniformly through the seams and forms a solid unified wall structure upon cooling.

During the forming operation, the steel strip is fed into rolling machines, where it is carried over stationary arbors that first crimp the sides, and by successive stages finally roll the strip into the double-walled tube formation. The product is being applied to refrigerator machines and in the automotive industry for gasoline and oil lines, hydraulic brake lines, etc., as well as many other applications.

The product shows excellent resistance to vibration, is ductile from the high-temperature treatment, affording easy bending and fabrication, has high radiation efficiency, which is

valuable for refrigeration work, and is capable of withstanding high pressures and temperatures. The tubing can be readily equipped with all standard fittings.

This method of fabrication insures uniformity in thickness of the tube wall, the inside and outside diameter being held within limits as close as 0.003 in. It also insures cleanliness and freedom from scale on the inside of the tube. The furnace temperature is about 2100 deg. F., which is well above the melting point of copper, and the alloying effects are such that the two walls of the tube cannot be torn apart after the product comes from the furnace.

Fig. 1 shows an enlarged section of the Bundyweld tubing, illustrating the welded bond between the walls of the structure and showing the means with which the strip is overlapped at the joint (at top) to maintain uniform wall thickness. Fig. 2 is a microphotograph of the joint where the edges

come together, showing the thin layer of copper-iron alloy within the joint firmly bonded to the steel.

Two furnaces are used for this work. Thirty-one strands of tubing, in varied lengths up to about 80 ft., are fed and discharged by driving rolls at each end of the furnace, the speed being approximately 2 ft. a minute, and the production of each furnace about 3700 ft. of tubing an hour. The tube mills run at a speed of about 60 ft. a minute, each furnace taking care of the output of one mill.

The tubing is cut in straight lengths as it comes from the mills and is then fed through the furnaces and cut into shorter lengths, after which it is formed into specified shapes. Frequently it is shipped in coils or delivered in short straight lengths to meet the individual requirements of users.

One furnace is used for brazing tubing in sizes up to $\frac{3}{8}$ -in. outside di-

FIG. 2. Microphotograph of the joint, illustrating the excellent bond between the copper and the steel.

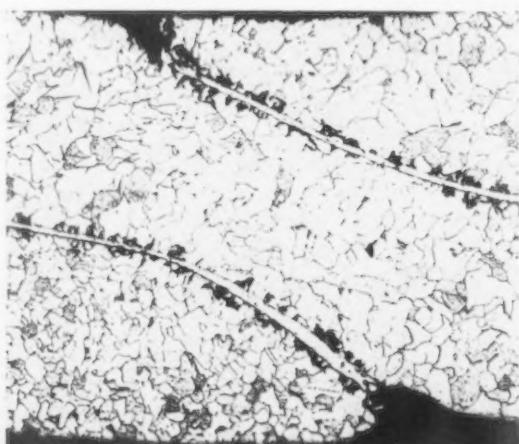
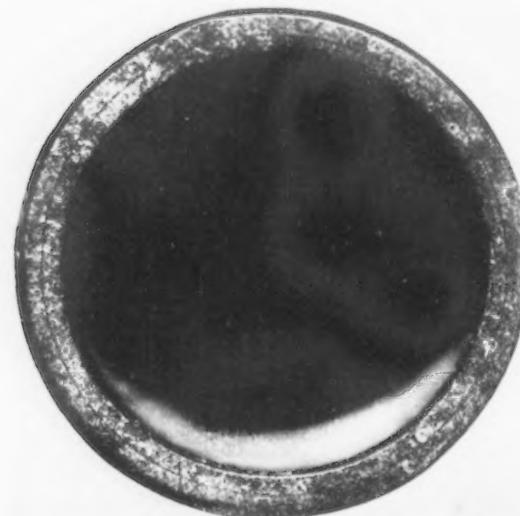


FIG. 1. Enlarged section of Bundyweld steel tubing, showing the double-walled structure.



ameter, while the other is used for sizes up to $\frac{3}{8}$ -in. Thirty-one alloy tubes are within the heating chamber of each furnace, by means of which the steel tubing is supported and guided through the heating chambers. The heating units in each furnace are divided into four temperature-control zones.

The larger of the two furnaces is rated 157 kw., 220 volts, 3-phase, 60

NS UNDER ATMOSPHERIC CONTROL



MAKING steel tubes by the aid of a copper-brazing process under atmospheric control gives excellent results in the quality of the product, according to the author. It is applied in many instances where particularly trying conditions must be met. The product is similar to a sweated tubing, but has advantages over that type of tube. In particular, it is easy to fabricate and shows good resistance to vibration.



cycles. Its inside dimensions are approximately 4 ft. 3 in. wide by 7 ft. 2 in. long, by 2 ft. 5 in. high. The cooling chamber, about 10 ft. long, consists of individual tubes attached to the alloy tubes within the furnace. The smaller furnace is rated 123 kw., 220 volt, 3-phase, 60 cycles, having inside dimensions approximately 3 ft. 8 in. wide by 6 ft. 8 in. long, by 2 ft. 5 in. high.

Resistors in the two furnaces are made of nickel-chromium ribbon mounted on the side walls and floor. The resistors are operated at much higher temperatures in these furnaces than ordinarily used in air, by virtue of the fact that the controlled atmosphere protects them from oxidation for a reasonable period of life.

Controlled atmosphere for these electric furnaces consists largely of hydrogen and carbon monoxide, being supplied by an electrolene producer which re-forms city gas with steam and heat. This device is a modern development which has made copper brazing and other controlled atmosphere applications economically possible.

Its operation consists of passing city gas and a controlled amount of steam through the chamber of the electrolene producer at approximately 2000 deg. F., where the hydrocarbons (methane and illuminants) dissociate into free hydrogen and carbon. The carbon and steam also enter into a reaction which liberates an additional quantity of hydrogen and carbon monoxide.



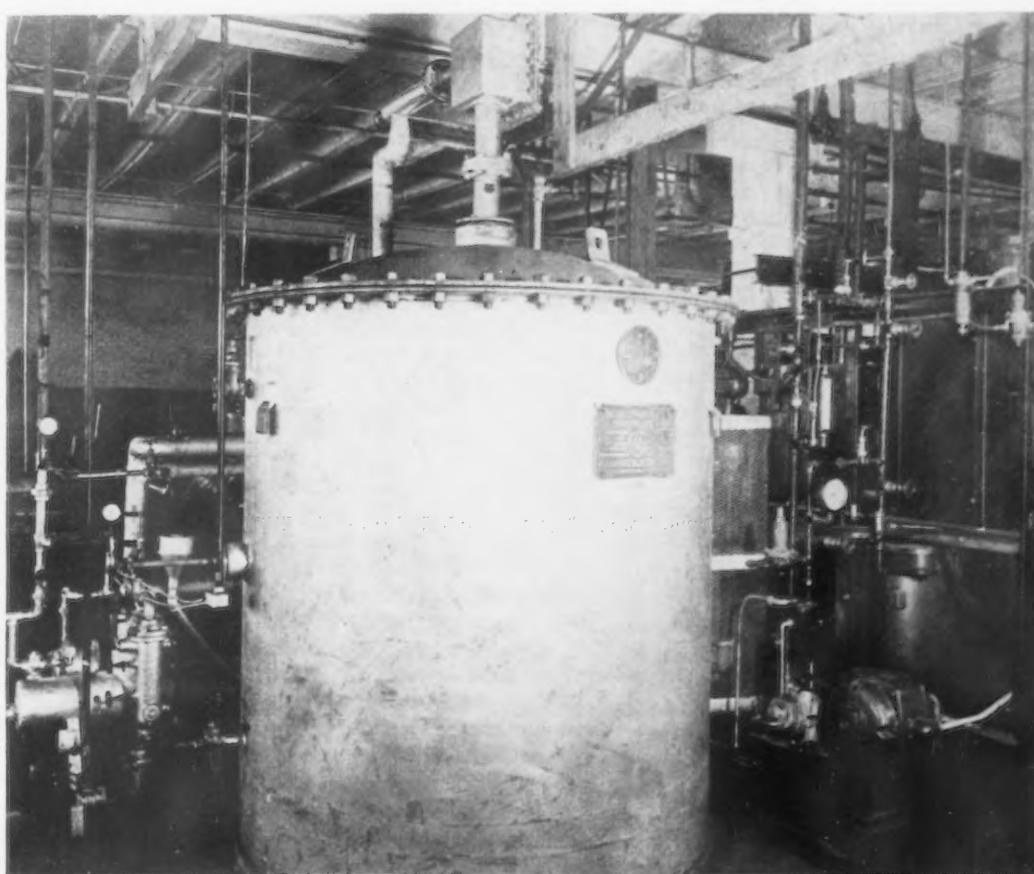
FIG. 3. Electrolene producer for supplying controlled atmosphere to copper-brazing furnaces employed by Bundy Tubing Co.

proximately \$1 for each thousand cubic feet.

Typical analyses of city gas and electrolene at the Bundy Tubing Co. plant in Detroit follow:

City Gas, Per Cent	Electrolene, Per Cent
3.5	CO ₂ 0.5
5.6	Illuminants 0.0
1.1	O ₂ 0.5
16.5	CO 25.0
46.8	H ₂ 67.0
18.2	CH ₄ (Methane) 1.0
0.3	C ₂ H ₆ (Ethane) 0.0
8.0	N ₂ 6.0
100.0	100.0

The electrolene producer is illustrated in Fig. 3. It is rated 25 kw., 110 volts, single-phase, 60 cycles, with an output of approximately 300 cu. ft. an hour. With the auxiliaries shown in the picture, the equipment is entirely automatic in operation, requiring no attention other than a casual inspection and ordinary precautions by the furnace operator.



100-200-1000

LUBRICANTS FOR BALL AND ROLLER BEARINGS

ALTHOUGH the purpose of a lubricant is to reduce the rise in temperature by eliminating friction, when an excessive amount of lubricant is used the heat developed from churning becomes greater than the reduction in temperature from lubrication, and the net result is a hot bearing. Hence when ball and roller bearings are operated at a high speed, it is important not only to use the right kind of lubricant but also the proper quantity.

In addition to the churning action on the lubricant in large bearings and also in the smaller sizes operated at a high speed, there is also present the effect of centrifugal force. The combined effect of churning and centrifugal force, augmented by a high operating temperature, requires a lubricant that will resist breaking up. In the case of greases, there should be no separation of the oil from the soap which is used to thicken the oil.

Lubricant Must "Stay-put"

Next to the savings effected in power, by minimizing friction, and the reduction of maintenance costs through the longer life of ball and roller bearings, the most important item is the lowered lubrication cost. Manufacturers of ball and roller bearings state that many of their bearings need not be refilled oftener than once in three months to one year provided a suitable grade of grease is used and the housing is effectively sealed. Grease is the preferred lubricant wherever possible because it possesses "stay-put" properties, does not work out of the housing, is more easily applied without waste, and keeps the moving parts sealed against the infiltration of foreign matter in the form of dirt, water and corroding fumes.

Most ball bearing manufacturers recommend grease as the preferred lubricant. Manufacturers of roller bearings are inclined to favor oil in the larger sizes, provided the housing design is such that there will be no leakage or when a circulating system is used. It is generally agreed that the kind of lubricant used depends entirely upon the method of application and operating tempera-

IN addition to comments relating to the use of grease and of oil, this second article by Mr. Reswick discusses the essential characteristics of a good ball or roller bearing grease. It includes also an interesting discussion of lubricants for extreme pressure conditions, as in rolling mill anti-friction bearings, and the development of a grease that provides greatly increased protection for bearings operated at high speed and under heavy pressure. The first article appeared in **THE IRON AGE** of March 10, page 608.

tures. Tests have shown that either form of lubricant gives the same results if properly applied, the rule being that a deficiency is better than an excess.

A prominent manufacturer of electric motors states that in his opinion 90 per cent of complaints on anti-friction bearing motors may be traced directly to using too much lubricant in the bearings, which results not only in hot bearings but also in damage to the windings and commutator parts from leakage. As there is no sure way of determining the exact amount of lubricant without disassembling the bearing, his recommendation is that the users of electric motors equipped with ball and roller bearings should be instructed to pack the bearings with grease at infrequent intervals and to take every possible precaution to avoid over-lubrication.

Large Roller Bearings Oil Lubricated

Large size roller bearings over 6 in. shaft diameter, operated at a speed exceeding 500 r.p.m., may be advantageously lubricated with a highly refined mineral oil in a circulating oiling system, in which case the lubricant serves as a coolant for the bearing as well as for minimizing friction. Oil lubricated bearings must of necessity be of a more complicated design than grease lubricated bearings. The consumption of oil is usually greater, as an appreciable loss occurs in volatilization and leakage. The oil must also be renewed very frequently because contamination with dirt depends entirely on the mechanical seal of the bearing, while at high speed the windage effect of the revolving elements may have a tendency to suck in dirt from the surrounding atmos-

phere. Special provision must be made in the form of wick feeds or circulating systems to maintain the proper oil level when straight mineral oil is used as the lubricant on ball and roller bearings.

The housing of ball bearings lubricated with grease should not be filled more than one-third full. When oil is used, it should be maintained at a level no higher than the center of the lowest ball or roller, as any excess will result in an increase of the operating temperature and in the waste of the oil through leakage.

The limiting condition in the use of grease is the peripheral speed of the inner race. On bearings of extremely large size, such used on the necks of rolling mills, the speed is seldom excessive, and as the necessity of keeping dirt and water out is very important, grease is the proper lubricant on bearings of this type regardless of size.

Specifications for Grease

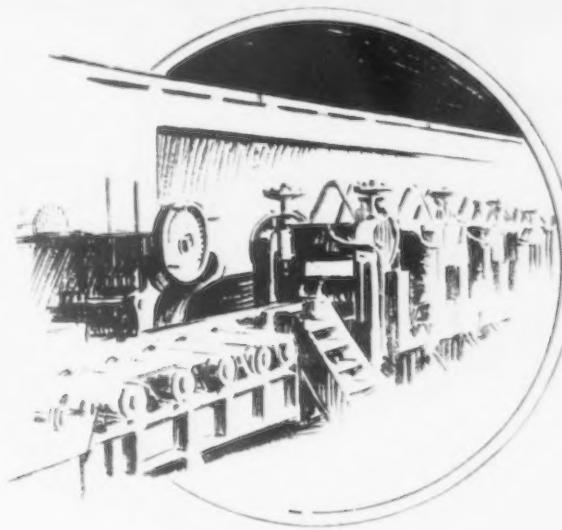
Good service from ball and roller bearings can be obtained only when the proper grease is used. Ordinary cup greases should not be used, as they break up into their constituent elements, causing the oil to separate from the soap. A good grade of grease at a higher price is ultimately more economical than a cheap grease for use in an expensive ball or roller bearing which is built to precision dimensions. The most essential requirements in a good ball and roller bearing grease are enumerated in the following paragraphs.

1.—Uniform Quality. As to general quality, the grease must be clean and free from any injurious fillers and foreign abrasive matter. Uni-

ROLLER BEARINGS

By MAURICE RESWICK

Chief Engineer,
Pennsylvania Lubricating Co.,
Pittsburgh



formity of product must be maintained so that the consistency, homogeneity and other properties shall not vary from one lot to another purchased at different times. The container in which the grease is packed and shipped must be perfectly clean and free from all scale and other dirt.

2.—Stability. Ball and roller bearing grease must not disintegrate nor separate while standing or when in service. In inferior greases the soap thickener often separates out and is deposited in a hard layer around the outer race, while the lighter oil is lost through leakage or volatilization. This causes channeling and leads to damage of the bearing.

3.—Absence of Fillers. No fillers like graphite, talc, pumice, rosin, free lime, etc., should be contained in the grease. Solid substances like graphite have a tendency to settle out, accumulating in the grooves and obstructing the free rolling motion of the balls and the rollers.

4.—Non-Corrosiveness. The grease must not corrode the highly polished bearing elements and must not contain any active free acids or alkalis. The action of an acid or alkali is to etch or pit the polished surfaces of the balls or rollers and races, and to accelerate rusting. The compounded grease must be free from uncombined fats and alkalis which produce a detrimental action on steel.

5.—Gumming and Hardening. Whether on standing or in operation, the grease should not become gummy or sticky. Also there should be no tendency toward oxidation or hardening of the grease. The soft consistency of the grease should be maintained at all times so that the starting torque be at a minimum.

6.—Temperature Characteristics. The ideal grease is one which could be used for operating temperatures from minus 40 deg. Fahr. to as high as 300 deg. Fahr. without liability of excessive stiffening at the lower temperature or becoming too fluid at the higher temperature. While a grease to meet these ideal requirements has not as yet been fully perfected, certain greases on the market approach it quite closely. In this respect greases are superior to mineral oil because their temperature characteristic curves are flatter and where an oil would become very thin at elevated temperatures, certain greases still maintain a reasonable consistency which prevents loss through leakage.

Grease is essentially a combination of mineral oils with fatty oil saponified by lime or soda. The requirements for general ball and roller bearing lubrication are best met in soda base greases which have greater stability and are less affected by agitation and variation in temperatures than lime base greases. A properly combined soda base grease may become semi-liquid at extreme temperatures but will regain its consistency on cooling, while a lime base grease will often break up under the same conditions. The melting point of soda base grease is considerably higher than that of any other type.

Where there is a likelihood of water or moisture getting into the bearing, lime base greases are preferred for the reason that soda grease has a tendency to emulsify, forming a soap lather, while lime base greases are water repelling. This accounts for the fact that in the lubrication of large roller bearings on the necks of rolling mills, where the speeds are comparatively low, a lime base grease

made up with a high viscosity oil is generally used.

Lubricants for Extreme Pressure Conditions

THE last few years have seen the extension of roller bearings to steel mill applications, replacing the usual brass and babbitt bearings on such units as reduction gears, pinion drives and roll necks. Mill operators are now beginning to appreciate the advantages of anti-friction bearings mainly on account of the closer adjustment to which the rolls can be held, and also because their use results in lower power consumption, longer life and easier lubrication. On four-high mills in particular, when rolling fine gage material, necks equipped with roller bearings enable the mill men to maintain a uniform gage over a long period of time, because the wear on the bearings is practically negligible.

The performance of roller bearings on four-high mill backing-up rolls proved to be so successful that the mill operators started to increase the speeds and reduce the number of passes by greater drafts until a point was reached where the pressures and speeds on the roller bearings were considerably greater than those for which they were originally designed. This was soon found out through the greater frequency of bearing failures, and the roller bearing manufacturers were called upon to remedy these troubles. As it was not possible to increase the bearing capacities on existing installations by an increase in size and as the strength of the bearings (rollers and races) was already up to the maximum that could be obtained with the best alloy steels possible to produce, it was natural (Concluded on advertising page 20)

MONEY SAVING IDEAS FOR MANUFACTURERS

Early Inspection Saves Labor

INSPECTING castings while "green" saves one plant an appreciable part of its cleaning cost. The inspectors are located just ahead of the sand blast and are paid a bonus based on the percentage of defective castings caught at this point while the heads and gates are still on. The cleaning labor on the rejected castings is naturally saved by this method and other advantages are claimed. The "green castings" inspectors regularly detect more than 75 per cent of the total number of defectives.

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Brass Used for Repairs

RECLAIMING worn machine parts by first building them up with metal deposited with a welding torch and then grinding the built up part to size has resulted in a marked saving in many large shops. One shop manager, instead of using steel welding rod to build up such worn parts, has found that he can use brass rod deposited with an oxy-acetylene torch with considerable saving in labor. In many parts, such as engine guides, shafts and piston rods, this manager has found that the use of brass to build up slightly worn surfaces results in a product about as satisfactory as the original steel part.

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Small Orders Billed Higher

THE danger of incurring a manufacturing loss on small orders is frequently overlooked and this is especially true with the present reduced demand. On a recent check-up of small orders,

a manager of a die casting plant was surprised to find that he was handling a good deal of unprofitable business because of the small quantities now specified by customers who formerly ordered in large volume and therefore enjoyed favorable prices. The die equipment for the smaller orders was on hand and paid for and at first glance he found it difficult to account for the loss. Further study showed non-productive items such as cost of handling dies, labor, and machine time during set up, supervision, paper work and billing, to be about the same for a small order as for a large order and this meant that even where the complete die equipment was furnished, the small order, to be profitable, usually would have to carry a considerably higher unit price than the large order.

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Jigs Save Welders Time

A MANUFACTURER of steel snow plows has taken much pains in designing bench jigs for holding the various parts in place for welding. These jigs he has built up as permanent parts of the bench and has arranged them so that the various joints come in convenient position for welding.

• • •

Needs Bricks; Finds Sunshine

AFTER operating for nearly twenty years in an old dark brick building with few windows, a shop manager found a need for some bricks and decided to take them out of one of his plant walls. In this way he secured the bricks that he needed and, incidentally, secured a new window and more light. He is now contemplating putting in many similar windows at many points around the plant and thus securing an excellent supply of bricks.

Customers' Service Department

A MANUFACTURER of machine tools operates a customers' service department. This department keeps some twenty designers at work on the manufacturing problems of prospective customers. Work comes to the attention of the department in the form of samples and rough specifications. The usual job is to redesign the part from the point of view of low machining cost and then to adjust the redesigned part to the customer's requirements.

• • •

Softens Nitrided Surface

A MANUFACTURER of electrical equipment was recently faced with the problem of machining a nitrided steel part. He placed the piece in a sodium potassium chloride salt bath maintained at about 1500 deg. Fahr., and then, after allowing it to cool slowly, he was able to machine it and to afterwards re-nitride it to give it its original surface hardness.

• • •

Fast Production Reduces Stock Needs

HIGH speed equipment sometimes offers a saving in other ways than in direct production costs. A manufacturer of steel barrels has installed equipment which enables him to make up from flat sheets and deliver a customer's order the day it is received. He can, in fact, transform a sheet into a barrel and have it painted and dried and on the delivery truck all in one hour. This high speed production makes it possible for him to carry no stock whatever of manufactured products and a relatively small stock of sheets.

S FOR WORKS MANAGERS

Buys Steel on Performance

ONE manufacturer of steel tubing has saved himself a lot of worry by specifying a definite performance for the steel he buys, instead of specifying physical or chemical characteristics. Such performance specification has forced steel companies to cooperate with him and thus develop the material best suited to his needs. This method of buying is usually welcomed by the steel makers and is applicable to many kinds of steel and to many uses.

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Acid Controlled for Cleaning

ECONOMY in cleaning preparatory to plating involves the amount of acid used, the weight of metal and the time required. For best results the various factors must be carefully adjusted. One plating plant has lowered the cost of the nickel plating of brass parts by the following procedure. The pieces are dumped into open aluminum wire baskets and then dipped consecutively in two acid baths. The first contains 50 per cent water, 30 per cent nitric acid and 20 per cent sulphuric acid and the second contains 50 per cent water, 20 per cent nitric acid and 30 per cent sulphuric acid. The duration of the dip is approximately two seconds in each bath. Washing is in clean running water.

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Chromium Plating Prevents Freezing

IN assembling accurately machined and polished steel parts it sometimes happens that two pieces freeze together making disassembling extremely diffi-

cult or even impossible. Such conditions are met with in the fitting together of two splined parts in the crankshaft assembly of certain airplane engines and it is also met with in some automobile engine assemblies. It is more pronounced when the two steels coming together are identical in analysis and hardness. One manufacturer has found that this tendency to freeze may be entirely overcome by chromium plating the surface of one of the joining parts.

• • •

Buys Bars Cut to Length

MOST job forge shops buy bars in random lengths. Bars cut to specified lengths at the mill cost slightly more but this is often offset by reduced scrap and handling costs at the forge shop. This is particularly true in the case of the larger sizes of bars and on work calling for long runs of similar sized forgings. One company after investigating has adopted the policy of buying all bars under $1\frac{1}{2}$ in. in diameter on a random length basis and all bars $1\frac{1}{2}$ in. and over cut at the mill to specified lengths.

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Carpenters Become Metal Workers

MITER boxes are being used to advantage by some manufacturers of steel tube products. The general scheme of joining various pieces of tubing to make up articles such as bedsteads is similar to the practice of a carpenter working with wood. Larger companies frequently use elaborate jigs and power saws but hand sawing and hand welding of light steel tubing parts afford a convenient and economical method of fabricating furniture and other similar products. "Turn the carpenter into a metal worker" is the slogan of one manufacturer.

An Afternoon Pause Helps

AMERICAN manufacturers who have visited English plants have often been surprised at the little afternoon recesses or tea periods which sometimes extend to the full shop force. An American manufacturer has recently tried out with considerable success, this afternoon breathing space. He has found that by giving his employees a 15 min. recess from four to four-fifteen, and keeping his closing time otherwise unaltered at five-thirty, he gets a higher total production per man than when no recess is allowed. He has combined this added rest period with a provision for no smoking during working hours.

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Continuous Welding Saves Time

AFTER starting the flame with the work in position even experienced welders require a brief interval to adjust the process to the working conditions. This brief interval previous to proper welding may represent a loss in time and efficiency. Often the quality at the start of a weld is not quite up to the quality throughout the balance. To overcome the possibility of a slight disturbance and loss of time at the start of each new piece of work, a steel barrel manufacturer has gone to considerable expense to build a conveyor which holds the cylindrically formed sheets in position for welding while it carries them in a continuous procession past the welder. By this means the process is uninterrupted. There is no necessity for shutting down the welding flame or changing its position in any way and a 100 per cent saving in welders' time is reported as a result.

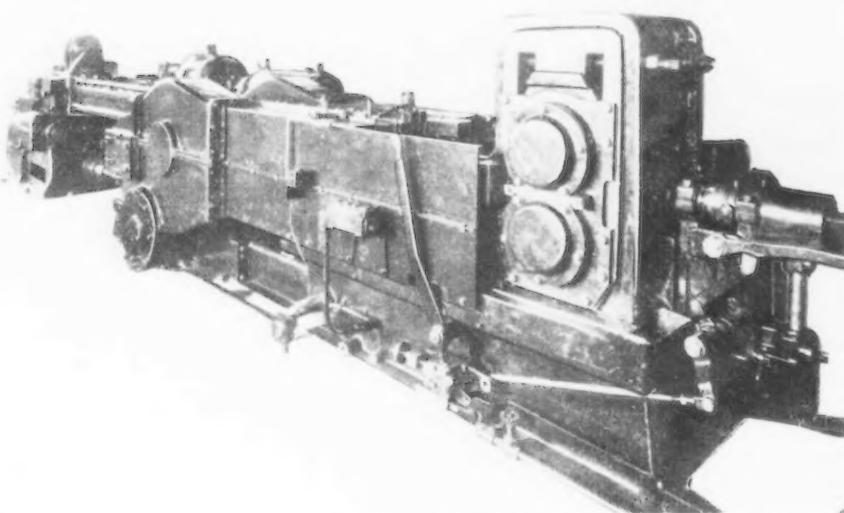
Reduces 2½-in. Tubing to 1¼ in. at Rate of 9 ft. a Minute

Machine Performs Cold Swedging-Forging Operation in One Pass

A REMARKABLE new machine for reducing the diameters and wall thicknesses of tubing has been developed by the Pipe & Tube Bending Corp., of America, Newark, N. J., a subsidiary of the Tube Reducing Corp. In one pass through the machine a steel tube of, say, 2½ in. outside diameter with a wall thickness of $\frac{1}{4}$ in., has been reduced to 1¼ in. outside diameter with a wall thickness of 0.09 in.

a matter of fact, it might be termed a cold extrusion process. The tube is pushed along step by step on a tapered mandrel and reduced to the final diameter. As each section of the tube is forged or extruded, the tube is moved ahead the required short distance and the operation repeated.

On the forward or forging stroke, two mating dies fitted into the rolls squeeze the tube and the metal is made to flow longitudinally under the



TUBE to be reduced is put into machine at far end. At the near end is a reciprocating saddle carrying the dies which reduce the tubing around a mandrel and force it step by step out of the machine.

The machine is adapted to handle non-ferrous as well as steel tubes with corresponding reductions. On special steel such as rustless steels, the reduction is naturally not so great as given in the case of ordinary seamless steel tubes. One of the specially noteworthy features is that further reductions in both diameter and wall thickness may be made without any intermediate annealing. At the conclusion of the processing, annealing has been found to restore the original structure.

Apart from the heavy and speedy work that the machine does on tubes, as a mechanism it is unusually interesting. The accompanying photographs and diagram will help gain an idea of the construction and operation.

A reciprocating cross-head or saddle contains two rolls which perform a combined cold swedging-forging operation on a length of the tubes. As

pressure. At the end of the forward stroke the tube is rotated 60 to 90 deg., and when the saddle makes its backward stroke the dies do a certain amount of kneading of the metal. This operation causes the metal to flow concentrically around the walls of the tube. Just before the beginning of the next forward stroke the tube is pushed into the rolls, say, $\frac{1}{4}$ in., and the dies again do their work on the forward stroke.

Especially noticeable are the quietness of the process and the speed. A machine observed in the plant of the Pipe & Tube Bending Corp. was making regularly 60 reciprocations, or double strokes, per minute in reducing a 2½ in. outside diameter by $\frac{1}{4}$ in. wall tube to an outside diameter of 1¼ in. by 0.090 in. wall, the speed of production being approximately 9 ft. per min.

The saddle amounts to a roll stand that is moved back and forth on slid-

ing ways by means of two long heavy connecting rods, one on each side. The rods moving together are mounted on their own other ends on a pin in each case carried by a revolving disk serving as a crank and driven through a speed reducer by a 75-hp. electric motor. This motor, which shows a load factor of approximately 35 per cent, operates continuously, and the machine automatically pushes through the tube the required distance just prior to the forward travel of the saddle. Then again the dies do their work; then, again automatically, at the end of the forward stroke the tube is revolved and the saddle slides back over the tube until it reaches the end of the backward stroke, when the cycle is repeated.

The machine seen in operation was given a regular length of steel tubing and then a length of copper tubing, and, in the case of the latter, to illustrate flexibility, part of the tube was given one reduction in wall thickness, and the rest another, which was accomplished by adjusting the position of the mandrel.

When the fresh length of tubing is pushed into the machine over the mandrel, the thrust block at the feeding end of the machine which holds the mandrel in place, is quickly locked in position. A long feed screw, 2 in. in diameter, carries a tail ring fitted against the end of the tube. The screw is geared to revolve momentarily just before the beginning of each forward stroke, sufficiently to feed the tube the required distance into the dies.

Parallel with this feed screw is a heavy shaft, the office of which is to give the tube the turn at the end of each forward stroke, as explained. On account of the length of the machine it is desirable to steady the mandrel carrying the tube, to prevent whipping. An ingenious arrangement is the successive spacing at proper intervals of what are steady rests, details which contribute to the smoothness of operation.

Heart of the Machine

The heart of the machine is the scheme of rolling. The two rolls are spur geared together outside the roll necks and the teeth of the gearing of the lower roll mesh also with the teeth of a rack. When the connecting rods slide the saddle (that is, the housing of the rolls), the rolls are forced to revolve; the lower by mating with the rack and the upper because it is in mesh with the lower. The rolls make a half revolution each stroke. The half of the rolls which come into contact with the tubing carry the forging dies; the other half of the rolls are semi-cylindrical except that in the dies themselves relieving is necessary to escape interference at the end of each rocking with the tube extending through the machine.

The dies have a semi-circular tapered grooving. The diameter is

gradually reduced from that of the tube to be reduced to the diameter which the completed tube is to have. The mandrel size provides for the resulting wall thickness of the reduced tube. Each die, in fact, forms one-half of what would be the working face of the roll and provision is made for their quick removal and replacement. Thus, a given machine has a wide range of size reductions. All that is necessary is to have the pair of dies for a desired reduction, together with the proper size mandrel, and arrange the machine for the proper step-by-step feeding of the tube, the change being quickly effected.

Work Done on the Metal

When a length of $1\frac{1}{4}$ in. tube of 0.090 in. wall thickness has been completed at each forward stroke, there is moving through the machine, for each such stroke (or for each cycle of a double stroke), an amount of about 0.41 cu. in. of steel. This, incidentally, is equivalent to a length of about $\frac{1}{4}$ in. (0.26 in.) of the entering large tube. By ascertaining the total amount of steel lying at any one time within the dies, an approximation may be made of the number of times work is done upon the metal in the reduction.

The rolls have a pitch diameter of 12 in. This means that the groove of each of the mating dies has a length of over 18 in.; or assuming an effective working length of 18 in., the tube itself, between the dies, is tapered for this distance. The truncated conical section has an outside diameter at the entering point of $2\frac{1}{4}$ in. and tapers in the length of 18 in. to the outside diameter of $1\frac{1}{4}$ in.

In short, while the machine in operation may at first convey the impression of giving heavy drafting of the metal, the kneading manipulation the metal gets is slight at any one point in view of the number of times pressure is applied. Pressure is mainly transverse across the tube walls and is taken up mostly by the rolls and thus transmitted to their housings. The result is that the thrust pressure is relatively light and the flow of metal is toward the outgoing end. Copious supplies of water, to which the material has been added to inhibit corrosion, keep down the temperature so that the tube as it issues from the machine is barely warm.

A practical and important feature of the machine that will have to be only mentioned rather than described is a contrivance for revolving the tail end of the tube when the last strokes are being applied. The accompanying illustration of the machine will indicate its substantial character as well as numerous detail parts which are not covered in this description.

John J. White is president of Tube Reducing Corp. and William M. Goss is vice-president. The present design

As the dies roll from A to B, the tapered grooves squeeze the tube against the tapered mandrel. On the return stroke, the tube being rotated for part of a revolution, the dies work out any likely eccentricities in the tapered portion of the tube.

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and development of the machine as a commercial entity are due to George B. Coe, chief engineer of the company, who for many years was development engineer for the American Brass Co. at Waterbury, Conn. The original patent was taken out by

George E. Neuberth, of the Pipe & Tube Bending Corp. The patents are now the property of Tube Reducing Corp., No. 18,329 covering the machine and process, and No. 1,842,280 covering the product made by the machine.

Offers New Line of Electric Trucks

THE Wright-Hibbard Industrial Electric Truck Co., Phelps, N. Y., has announced a new line of electric industrial trucks, one of which, the RBH series elevating platform truck, is shown in the accompanying illustration.

New features include a controller assembly of greatly improved wearing quality and efficiency. Much larger and heavier contacts of hard-drawn copper are employed and the controller fingers are of a new large self-aligning type having hard forged tips 1 in. wide. The gear case assembly

has been redesigned to permit quick removal of the motor from the case merely by loosening five cap screws. Hyatt roller bearings with hardened shafts and hardened outer races are now used throughout the steering mechanism to improve the steering and eliminate wear. The more rigid side panels now used are designed to distribute stress and shock evenly throughout the truck and also to provide additional room for larger drive and lift brakes. A full circle type drive brake and a lift brake of much larger capacity are now employed, the drive brake being 3 in. wide and the lift brake $1\frac{1}{2}$ in. wide, both of contracting type.

The new frame assembly and lifting mechanism is of roller-incline type,

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REDESIGNED units include the controller assembly, gear case, side panels and battery compartment. Compactness and the absence of protruding parts are features.

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having Hyatt roller bearings in the rollers. The shafts are larger and heavier and are pack hardened and ground to size. It is stated that with this construction friction is virtually eliminated. Alemite-Zerk fittings are installed on all clevis pins so that the pins can be pressure lubricated by means of a Zerk gun, assuring constant lubrication and thus eliminating wear. The pins and their bushings are pack hardened and hand fitted.

The battery compartment is of new

design and the trucks are equipped either with a 12-16 volt or a 24-30 volt motor, to suit the user's battery charging equipment. Several new platform sizes are offered in the elevating platform truck, with heights in the lowered position ranging from 6½ to 11 in., inclusive. Compactness features the new line, the new RBH series elevating platform truck, for example, being said to negotiate 41-in. intersecting aisles with 34-in. skids.

r.p.m., is available. The speed series desired is selected by the combination of a small lever to the left of the speed-change lever and the back-gear lever. One revolution of the speed-change lever in either direction gives a change of spindle speed in the series selected, the speed for which the machine is set being shown on the direct reading dial. To assure maximum smoothness of drive, all speed gears are ground.

Thirty-two changes of feed, ranging from $\frac{1}{2}$ to 62 in. per min., provide the feeds usually associated with milling work, but also make possible economical rates of feed when machining non-ferrous metals. Changes in power feed of the table are made by rotating either the front or the rear feed-change lever, one revolution of which accomplishes a change in feed in the series selected. The feed series desired is selected by the lever at the left of the feed-change lever on the side of the machine. The rate of longitudinal feed engaged may be read on the direct reading dial from either operating position. Transverse and vertical feeds engaged are 4/10 of the feed shown on the dial.

The main driving motor is entirely inclosed within the lower part of the column. The chain guard and cover for the rear of the motor compartment are hinged to provide access to motor, chain and driving sprockets. The starting mechanism is placed above the motor under the chain guard, the electrical controlling mechanism and wiring being thus entirely inclosed and protected. The machine table is designed to handle large quantities of cutter coolant; strainers are provided on all four sides and cross channels facilitate quick disposal of the coolant.

Double overarm, standardized spindle end, one-piece elevating screw, anti-friction bearings in all main mechanisms, simplified oiling and other features of the company's previous millers are included in the new machines.

New B & S Milling Machines Have Spindle Speeds up to 1300 R.P.M.

THE new line of high-speed column-and-knee type milling machines brought out by the Brown & Sharpe Mfg. Co., Providence, R. I., will be made in both the No. 2 and No. 3 sizes, plain and universal.

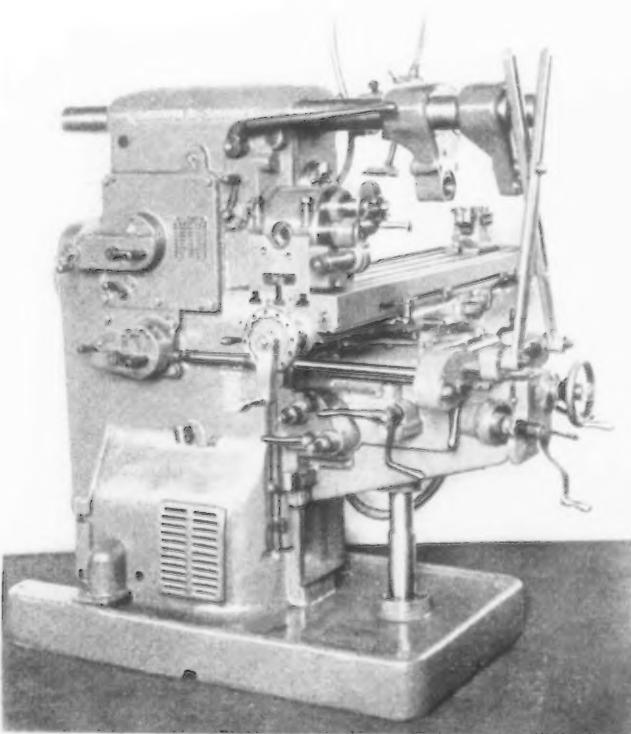
Savings in milling costs are attributed not only to increased cutting speed, but to reduced setting-up time through dual front and rear controls and to the reduction in time between cuts through power fast travel in all directions. The machine is designed to permit effective use of tungsten-carbide and other new hard alloy cutters.

Features of construction include the arrangement whereby the motor runs only when the machine is actually cutting, which makes for operating economy. No clutch is used; the starting lever throws the switch controlling the motor and in the down position also operates the spindle brake.

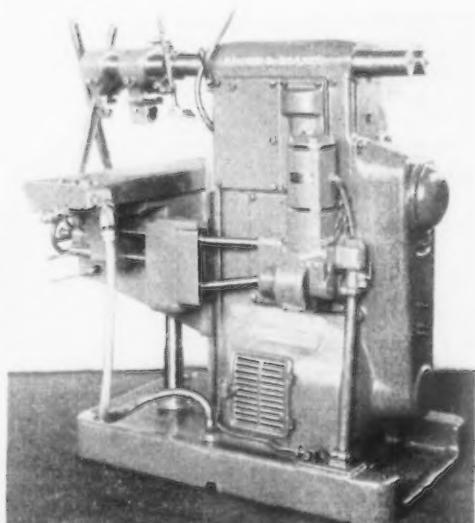
Every power movement, hand adjustment and power rapid travel control is available at both the front and rear operating positions. The hand adjustments at the rear of the table are fitted with easily-read graduated dials, and a safety device prevents engagement of the power feed while using hand adjustments. The longitudinal hand control incorporates a safety feature and gives a choice of long leverage through a crank, or the advantage of "rimming" the hand-wheel for delicate adjustments.

Power fast travel for the table is available whether or not the main driving motor is running. This fast travel mechanism is driven by an individual built-in motor located on the side of the machine. The same motor drives the cutter coolant pump.

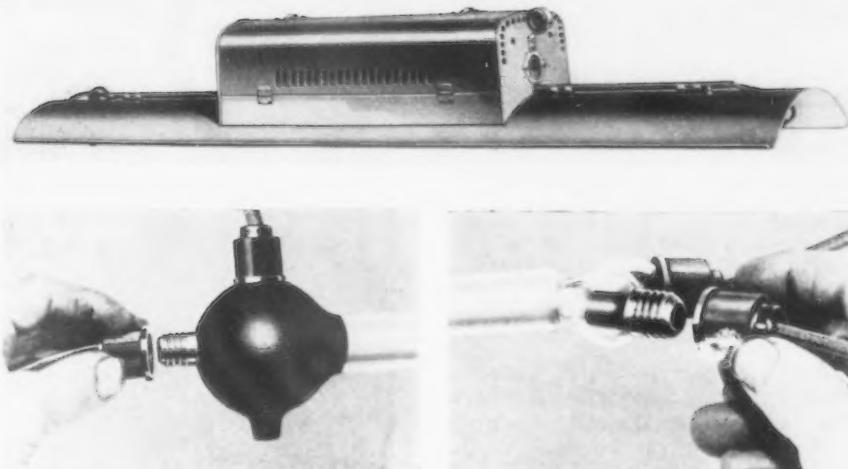
Thirty-two changes of spindle speed, ranging from 20 to 1300 r.p.m., are provided, and a wide range of back-gear speeds, 16 changes to 238



In addition to high speed, the machine features reduced setting-up time through dual front and rear control. The rapid traverse mechanism is driven by a separate built-in motor on the side of machine, as shown in view at right.



Improved Cooper Hewitt Mercury-Vapor Lamp



The lower views show ease of attaching the new insulated screw base terminals of the improved Cooper Hewitt lamp.

IMPROVEMENTS in tube design and performance, simplified reflector equipment and simpler and more rugged auxiliary equipment feature the new model Cooper Hewitt Electric mercury-vapor lamp for industrial lighting recently announced by the General Electric Vapor Lamp Co., Hoboken, N. J. Sharp corners have been eliminated, wiring is inclosed and the general appearance has been improved.

A new style straight line appearance for the mercury-vapor tube or light source has been developed. Positive terminals are now in the plane of the tube and are materially reduced in length. Negative terminals have been relocated at the top of the bulb and are also reduced in length. Two styles of tube are now made, one for horizontal and another for vertical operation. Tube terminals are of intermediate screw-base, screw-shell type and by means of insulating covers they are easily attached by hand. The location of the negative terminal serves as a positioning point and prevents rotation of the tubes in service, which eliminates the tube burnouts sometimes caused by rotation of the negative terminals about the mercury pool. The simplification and the straight line form of the new tube are emphasized as reducing materially shipping and handling hazards.

The new reflector features rounded corners, concealed wiring, greater reflecting surfaces and the elimination of holes, and is said to be a much more efficient unit and to be easier to clean. The auxiliary is slightly longer than in previous models. It has draw pressed end-plates with rounded ends and flush mounted plugs. Larger spacings within the auxiliary permit easier access to resistance units, transformer taps, attachment plugs, etc.

A copper-oxide rectifier replaces the starting resistance coil formerly used, supplying direct current for the shifter action. Starting of the new model is said to be twice as fast as formerly and to be more uniform.

Ballast resistance coils are entirely covered with a metal shield, the new unit resulting in a lower temperature and complete protection of the re-

sistance wire from contact with external materials. The lamp is now finished in standard black and in battleship gray.

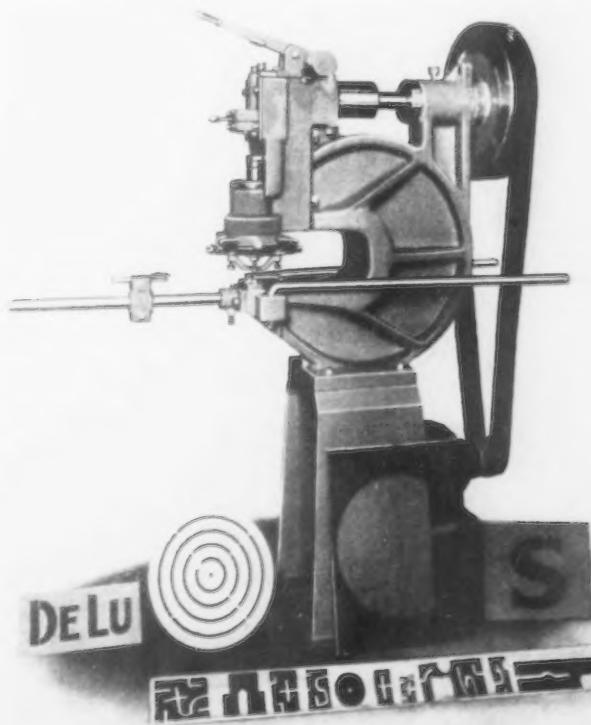
Gray Turret-Head Metal Cutter More Easily Operated

THE new model Gray turret-head metal cutter or nibbling machine built by the Gray Machine Co., Box 596, Philadelphia, has a turret head that permits the operator to cut shapes in sheets or plates without turning the stock through the gap or throat. This permits use of a machine with smaller throat and reduces floor space requirements. The machine will handle sheets that are twice as wide

as the throat depth, and of any length. The turret of this machine can be locked in eight different positions to facilitate handling and turning of small pieces by the operator.

Double micrometer adjustable strippers make it possible, when duplicating parts by means of a master templet, to adjust one of the strippers to rest on top of the templet while the other stripper rests on the stock,

THE turret head permits the operator to cut shapes in sheets or plates to any design without turning the stock through the gap or throat. The machine can be quickly converted into a shear for metal up to $\frac{1}{8}$ in. thick.



which is on a lower plane. In preventing the stock and templet from being picked up more on one side than the other, this makes stripping even and level, preventing chatter and breakage of cutters.

Several sizes of the machine are built, for cutting stock from the lightest gages to plate 1-in. thick, by the nibbling process. In addition to nibbling, these Gray units can be converted quickly into shearing machines for stock up to $\frac{3}{8}$ -in. thick, intricate shapes being cut with the shearing attachment.

A special gag mechanism instantly disengages the cutting tool, lifting it high enough over the master templet and stock being cut for entering the tool when making inside cuts. This mechanism also stops the cutting action of the ram while material is being inserted. A small hand lever reengages the gag mechanism and puts the machine in operation.

All eccentric shafts are interchangeable for using a large or small throw and are hardened and ground to assure long life. The ram and tool holder are hardened, ground tool steel.

The circle cutting attachment at the front of the machine permits cutting rings and disks and round blanks to accurate dimensions. The arms at the sides of the machine can be set at any angle to best support the work and to avoid interfering with a proper view of the cut.

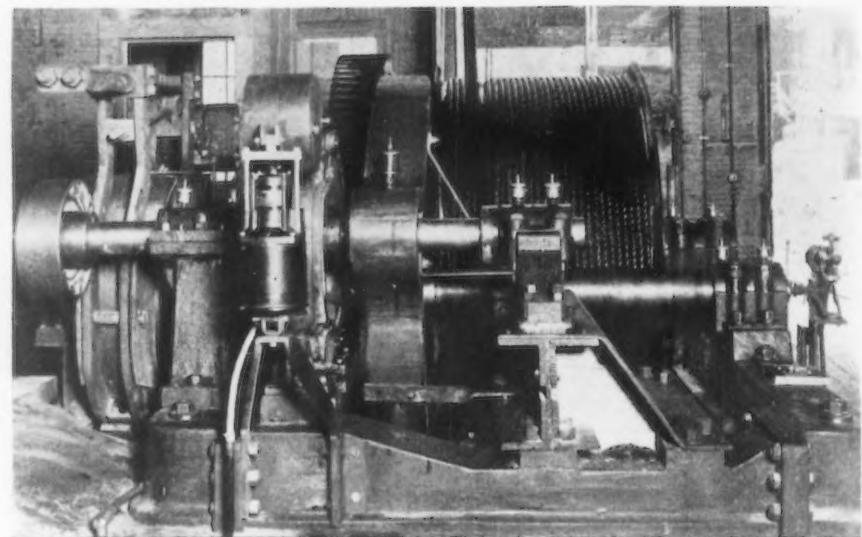
The ram guide bearing has micrometer adjustment for taking up wear, thus preventing side movement of the ram and scoring of cutters and dies. The bearing is also self-adjustable in case the operator neglects keeping the micrometer screw adjustment tight. This feature is emphasized as eliminating the dulling of tools or dies from misalignment or lost motion in the ram bearings.

Tip Adaptor Widens Range of Welding Torch

BY means of the tip adaptor illustrated, a new product of the Linde Air Products Co., 30 East Forty-second Street, New York, the stems and tips of the Purox No. 00-D aircraft welding torch and the stems



and tips of the No. 00 welding and lead burning torch may now be used on the company's Purox No. II welding torch. This enables a welder who has only an occasional light welding job to employ the correct welding tips for this small work and eliminates investment in a complete welding outfit for such occasional light jobs.



Skip Hoist Braking Facilitated by Thrustor Device

By J. F. BAKER
General Electric Co.,
Birmingham, Ala.

AS now equipped, the skip hoist at the Ensley, Ala., plant of the Birmingham Slag Co. comes to a stop at the end of its travel with a cushioned smoothness that means more flexible manipulation of the hoist than its operators had before, and at practically no maintenance expense.

This is a decided improvement over the braking performance several months ago when the safety brake-setting operation was awkward in operation and seldom used in "inching

up" the skip, and when the operating brake gripped so suddenly as to jolt, and impose a severe strain on the motor, shaft, bearings and gears.

By the application of a 600-lb. Thrustor to the safety brake, and a 150-lb. Thrustor to the operating brake, the difficulties experienced with the former operation have been removed. The Thrustors act positively, but go easily into their grip through the action of an adjustable time-delay device.

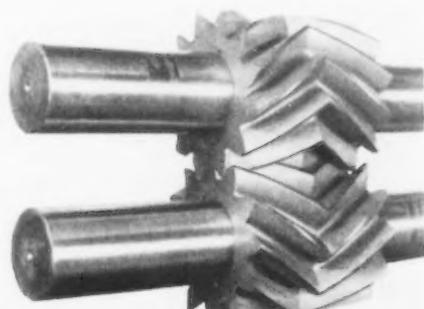
Herringbone Pinions Used as Pump Rotors

USE of Farrel-Sykes herringbone pinions as impellers, sometimes called cams and rotors, for the gear type of pump is here illustrated. Unusual efficiency both mechanically and volumetrically is claimed for pumps made with these gears, which are more widely known perhaps in connection with power transmission applications.

In the smaller sizes, these pumps with direct connected motors may be run at speeds up to 1800 r.p.m., states the Farrel-Birmingham Co., Buffalo. They are frequently used for high pressures; 1000 lb. per sq. in. is standard with some makers using gears of this type and in some special cases the gears are used for pressures up to 1500 lb. per sq. in. The gears have been applied to large capacity pumps; those shown in the illustration run at 435 r.p.m. and pump 625 gal. per min. against a head of 200 lb. The pump

is small for its capacity and requires no reduction gears.

The Farrel-Sykes pump rotors are made in a variety of materials, including bronze, high-carbon forged steel, nickel-alloy cast iron and various alloy steels including Nitrallloy. They are accurately made and have no backlash and no bottom clearance. The shape of the tooth is designed to reduce to a minimum the trapping of the liquid and to eliminate hydraulic noises.



Financial Strain Relaxed and Panic Eliminated

By DR. LIONEL D. EDIE



THE world financial panic has subsided, says Dr. Edie, but business has thus far shown few tangible evidences of betterment. Among heartening domestic developments are an upturn in the reserve balances of member banks of the Federal Reserve system and a decline in rediscounts. These changes, while small in amount, are significant because they represent a reversal of trend.

The pace of business improvement, if it actually gets under way, will be conditioned by various uncertainties. These include the reaction of the world to the Kreuger suicide, the outcome of the Lausanne Conference, the turn of events in agriculture, and the progress of Great Britain in coping with its monetary and trade problems. The rise of pound sterling, encouraging as it is, has not altered the fundamental economic factors impeding British recovery.

In Europe and this country alike, relief from financial tension has opened the door for constructive action, but actual gains in business activity may be slow, Dr. Edie states.



THE panic element has, to a considerable degree, been taken out of the whole economic situation by recent events. Business sentiment has improved, but tangible evidence of business recovery is still lacking. The improvement of confidence will be subjected to a severe test by the shock of the Kreuger tragedy.

The mere elimination of the panic element relieves the patient of acute suffering but it does not constitute a guarantee of recuperation. More vigorous constructive effort is necessary if business betterment is to follow upon the preliminary financial measures which have thus far been taken.

The rescue measures adopted in Washington have now entered a second stage. The first stage may be thought of as the stage of mysticism, ballyhoo and fantastic claims. The present stage may be thought of as the stage of de-bunking, of recognizing the drab limits of mere rescue activities, and of appraising the residue of tangible good which exists in the rescue proposals. The Reconstruction Finance Corporation was launched as a two billion dollar enterprise, but actual loans have been less than 10 per cent of the fanciful first estimate. The Glass-Steagall bill was heralded as an act of inflation, and absurd estimates of currency expansion and credit expansion were showered upon the public. It is now realized that the glamor surrounding the introduction of the bill was highly unrealistic. We can now look back upon the tone of discussion which prevailed a few weeks ago as a symptom of financial illiteracy on the part of the public.

Nevertheless, there is a residue of constructive value in both the Reconstruction Finance Corporation and the Glass-Steagall bill. They have stopped the alarming wave of bank failures and have, for the time being at least, removed the fear that the United States might be pushed off the gold standard. These accomplishments have warranted a rebound of confidence and have stimulated a hopeful attitude toward the prospect for business recovery.

Federal Reserve Policy Experimental

Recovery, however, is only in the stage of hope. There is scarcely any statistical evidence of business pick-up. Whether or not the hope that such evidence will appear later on will be justified will depend largely upon the policy pursued by the Federal Reserve Banks and by the member banks in cooperation with them. Up to date the Federal Reserve have sent up a trial balloon in the form of very small purchases of Government bonds in the open market. The amounts of such purchases are trivial in themselves, but if they are followed up by more aggressive policy in the future they may pave the way toward visible recovery. The industrialist is entitled to wonder whether the Federal Reserve will actually follow through the policy which was launched two weeks ago. Will the policy be abandoned in the event of another scare emanating from Europe? The outside observer can not have any very positive convictions as to the perseverance of the Federal Reserve Banks. They have not given the public any very definite assurance that a vigorous policy will

be pursued. The business man cannot make commitments in the firm confidence that a constructive policy will be carried through in the face of disturbing surprise news.

This condition of uncertainty means that the financial forces back of recovery will exert their influence in a rather half-hearted way. Business will have to feel its way along in the absence of an unmistakable and positively assured credit policy.

Improvement in London

At the same time that preliminary financial improvement has taken place in the United States, encouraging financial news has come from London.

London has paid off 150 million dollars of credit to New York, has given the exchange market more freedom, and has enjoyed a rise in the sterling rate. Curiously enough, the London improvement seems to have originated in imports of around 200 million dollars of gold from India. The disgorging of India's hoard of the yellow metal has been a remarkable episode in international finance. The mere fact that a relatively small amount of gold could turn the tables for the financial center of world trade is evidence of the tremendous power which a relatively small change in funds available can have over an entire financial system.

Coupled with the influence of Indian gold has been the influence of a repatriation of some of the capital which participated in the flight from the pound sterling last autumn. Another important influence has been the gradual recognition on the part of

the outside world that, by virtue of having severed the pound sterling from the direct influence of the dollar, internal deflation of commodity prices in England has come to an end.

However, it would be easy to exaggerate the improvement in England's position. England's income from foreign investments has probably declined about 400 million dollars during the last two years. Moreover, her current balance of trade has been running strongly unfavorable, but most important of all, perhaps, is the fact that England has seen fit to join the ranks of those countries which believe that a high protective tariff is a source of prosperity. Thus, England has fallen in line with a worldwide tendency to increase re-

strictions upon international trade. One result will be a tendency for English costs of manufacturing to increase and, therefore, for England to find increasing difficulty in meeting competition in world markets. Since exports are the life of trade in countries such as Great Britain, this resort to high tariffs does not deserve the favorable interpretation which has been placed on the measure by many authorities.

The only calm observation that one can make is that the relaxation of intense financial strain on London is encouraging but does not, in any way, guarantee that England will promptly step back on the road of prosperity. It is only a short time ago that the most intelligent observers were pointing out England's fundamental economic difficulties. These were the lack of rationalization of domestic industry, the high level of labor costs, the tariff warfare among the principal nations, and the uncertainty about a settlement of reparations and war debts. Few, if any, of these basic fundamental problems have been solved by what has taken place to date. The financial improvement opens the door for constructive action on these basic problems, but actual progress must be expected to be slow and gradual.

From the American standpoint per-

haps the most interesting development in French finance has been the cessation of gold withdrawals from New York. This cessation may be only temporary. It is possible that they may be resumed a short time in advance of the Lausanne Conference in June. The great question brooding over Continental Europe during the coming months will be the Lausanne Conference. Although there are rumors of a Franco-British accord on the question of reparations, nevertheless there remains a great deal of uncertainty as to the outcome of the conference.

The adamant insistence on the part of Germany that reparations must be brought to an end is significant, not so much because of the amount of

policy is the agricultural outlook. A crop scare could easily produce a substantial advance in farm prices, whereas bumper crops could easily produce a sharp further deflation of farm prices. If Federal Reserve policy receives the support of rising farm prices, due to weather factors we could easily have a firmer tone in the commodity price structure at large. On the other hand, if the weather factor further depresses agricultural prices, credit policy would be in the position of trying to push a large stone uphill. Hence, there is an unforeseeable and unpredictable element in the whole problem of the pace of recovery in this country. This is the accidental factor of crop weather.

The observer who is trying to estimate the pace of business recovery has to adopt a very flexible point of view in light of this accidental factor in the whole problem. Agricultural purchasing power in the United States is so thoroughly depressed that it constitutes a tremendous drag upon all efforts at economic improvement. Unless farm purchasing power can be helped by an act of God in the form of suitable weather, it will tend to hold back the forces of recovery in all other directions.

Member Bank Reserve Balances

In previous articles the writer has stressed the importance of watching the fluctuations in member bank reserve balances. These are the active reserve base of the entire credit structure. Open market purchases are of no avail unless they influence these reserve balances.

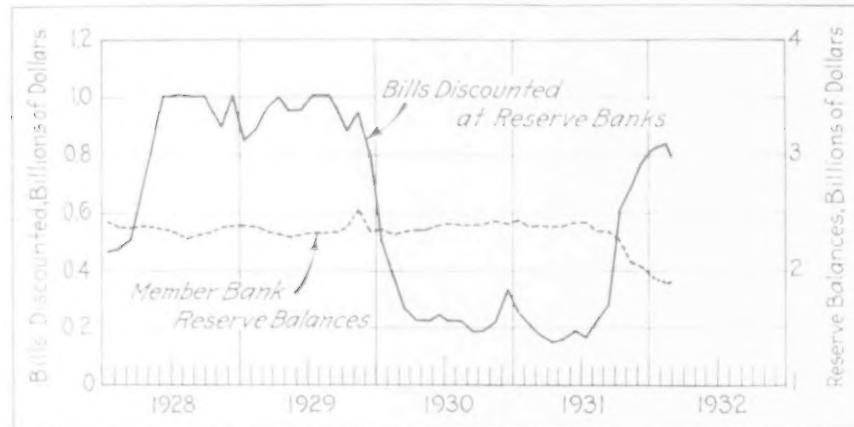
The accompanying chart indicates that during the past two weeks a slight upturn has occurred in the curve of such balances. This reverses the trend that has hitherto prevailed for many months. As yet the amount of reversal is insignificant, but the change in direction is encouraging.

At the same time, rediscounts have turned down slightly. Decline in rediscounts is a symptom of relaxation of strain in the banking system. The amount of decline thus far is small, but it is a move in a favorable direction. It remains to be seen whether these favorable developments will reach out for the benefit of the public. If they are to do so, we should expect to see the tangible result in the form of an increase in loans and investments of member banks. Such an increase has not yet put in appearance, but there is fair hope that it will do so after the March 15 Treasury financing is out of the way.

The Elements of the Situation

To summarize briefly, the elements of the present financial situation are as follows:

(a) The panic factor has been eliminated from the economic picture, at least for the time being.



money involved in payments, but because the German attitude is interpreted as a challenge to the Treaty of Versailles itself. France has made the sanctity of the Treaty of Versailles a cardinal point of international relations and it is scarcely conceivable that France will yield to any settlement which opens the way for further attacks on the treaty. It is futile to try to guess what the financial solution of the problem may be, but it is well to recognize that the diplomatic battle is fraught with momentous consequences. If a happy solution can be arrived at, the door will be open for general European recovery. If the right solution cannot be arrived at, the door is open for critical developments. Whether the Kreuger suicide is an omen of storm gathering over Europe or not, remains to be shown by the unfolding of day-to-day events.

The Agricultural Phase of Recovery

Purely financial measures have to be interpreted in the light of general economic developments. Federal Reserve policy has to be interpreted in the light of possible surprise economic developments in the United States. At the present time perhaps the most important general economic development which could profoundly affect the consequences of Federal Reserve

(b) This has created a better sentiment, but has not yet created any business improvement that can be measured statistically.

(c) The fantastic claims for the Reconstruction Finance Corporation and the Glass-Steagall bill have been debunked and the residue of solid value in those measures is being recognized.

(d) The inflation scare has proved, so far as any developments to date are concerned, to be only a scare.

(e) Federal Reserve policy has assumed a very mild expansionary form, and if this is followed up more vigorously as time goes on there is reasonable hope that financial influences will gradually bring about business recovery.

(f) There is real financial improvement in London, but until the more fundamental economic problems of Europe are settled it is unwise to ex-

aggerate the speed of London's financial recuperation.

(g) French gold withdrawals have stopped for the time being, but may be resumed before the Lausanne Conference. That conference promises to be one of the most important events in 1932.

(h) The speed of recovery depends, among other things, upon the accidental factor of crop weather during the next few months.

Products for Re-Manufacturing, Such as Steel and Pig Iron, Will Escape Sales Tax

WASHINGTON, March 15.—Estimated to raise \$595,000 in the fiscal year 1933, the emergency manufacturers' sales tax plan, now before the House of Representatives as one of the basic parts of the revenue bill of 1932, is the first of the kind ever attempted by the United States Government. It is built upon the principles of the Canadian sales tax, in operation since 1920. The fact that it has been applied 11 years in Canada is pointed to as proof of its satisfactory results.

Outstanding arguments put forth for the plan are:

It yields large revenue.

It is simple and cheap to collect. (Estimated at 5 per cent in Canada.)

Pyramiding is avoided.

The rate, $2\frac{1}{4}$ per cent, is low so that the burden, spread over a large body of consumers, will be relatively light.

Members of the House Committee on Ways and Means, which reported the bill, think the tax will not be universally passed on to the consumer, but in many instances will be absorbed by the manufacturer.

An analysis of practical operation of the proposed law has been prepared on the basis of an interview with Ellsworth C. Alvord, Washington, former Assistant Secretary of the Treasury, now engaged in private law practice. Mr. Alvord made a study in Canada of the sales tax law there, and at the request of the Treasury Department and the Committee on Ways and Means drafted the provisions of the pending bill.

Future Deliveries to Be Taxed

The tax would apply to all manufacturers doing business in excess of \$20,000 annually. It would become effective 30 days after enactment. The tax would be collected by the Bureau of Internal Revenue on the basis of the ultimate manufacturer's wholesale price and would be payable 30 days after it is due. Purchasers would be required to pay taxes on contracts

made before March 1, 1932, for future delivery. There are many exemptions. Among them are farm and dairy products, newspapers, magazines and other periodicals, books, etc.

The license system would be the method of control. It would give a knowledge of the manufacturer, where he is, and what his business is. The charge for each license is \$2. Jobbers or wholesalers would be licensed, if they so desire, and if they are selling materials for use by manufac-

urers. If licensed, they could buy from manufacturers and sell the materials to other manufacturers without the payment of the sales tax.

The tax would not apply to (1) sales by a licensed manufacturer to another licensed manufacturer of articles for further manufacture; (2) sales by a licensed manufacturer to a registered dealer of articles for further manufacture to be resold to a licensed manufacturer; (3) sales by a licensed manufacturer to any person of articles for further manufacture to be resold to a licensed manufacturer, but only if such articles are delivered by the first licensed manufacturer to the second licensed manufacturer; (4) sales for exportation, and (5) sales to municipal, county or State governments for governmental uses. It would apply, however, to sales to the Federal Government.

Would Apply Also to Imports

The tax would also apply to imports, with certain exceptions, such as coffee, tea and sugar, on the basis of the dutiable value plus the tariff, if any. On the finished products for ultimate use the tax would be levied on the imports as they enter the country. On products for further manufacture they would apply to the final producer. There are additional taxes on imports of lubricating and fuel oils, gasoline, etc.

Covering, as it does, the ultimate article, the tax would apply only to a minor degree in the iron and steel industry. For only infrequently is a rolling mill product a "finished" product in the sense of the proposed law.

Products That Are Exempt

Pig iron and semi-finished material, such as blooms, slags, skelp, billets and sheet bars clearly would be exempt under all circumstances. Scrap generally would be exempt, though such an item as relaying rails apparently would come under a taxable status. Steel bars, plates and shapes and other so-called finished products, if processed further by a licensed manufacturer—or, in the terms of the

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Testing Society Committees Confer in Cleveland on Specifications

trade, by a remanufacturer, such as the hardware producer—would assume the tax, not at the rolling mill, but at the plant of the remanufacturer. Steel rails are one of the few examples of a rolled product that would always take a tax at the mill, since it goes into use without further processing. Lines such as wire and wire fencing going to the ultimate consumer would be taxed at the mill also. But, if further processed or fabricated into an integral product, the tax would apply at the plant of the maker of the assembled unit. Bolts, nuts and rivets are used in fabricating. Therefore they would be taxed when the finished article is sold by the fabricator. Sheets, whether hot or cold-rolled, are for remanufacture or fabrication within the meaning of the proposed law and would be taxed at the final assembly plant. Going to an automobile manufacturer, the latter would assume the tax. Cold-rolled material worked into stamping ware would assume the tax at the stamping plant if the product went direct to a consumer. Going to an automobile plant for use in producing a car the tax would be collected on the sale of the automobile. However, if sheets went into immediate use without further processing the sheet seller would assume the tax. This is so rare as to be negligible.

It will be seen that, no matter how many are the manufacturing processes, the tax would not apply until the product becomes part of the integral product or is ready for use.

How Pyramiding Is Avoided

In the case of finished repair parts, the tax would rest at the plant of the repair part manufacturer. Gears used in the repair of automobiles are of course the finished product of the gear manufacturer. Sent to the repair man, who is not considered a manufacturer, they would be taxable at the plant of the maker of the product.

Metal-working machinery, being a finished product for final use, would be taxed at the plant of the builder. Castings, if for ultimate use, would be taxed at the foundry. When made a part of a finished product, the manufacturer using the castings would assume the tax.

Thus, pyramiding is avoided by the system of licenses. If one licensed taxpayer buys from another licensed taxpayer he notes his certificate number on his order and this is noted on the sales invoice and the sale is exempt. When the last licensed taxpayer sells to an unlicensed purchaser, the tax is collected. In this manner only one tax is imposed. When taxes have been paid credit or refund is allowed where it is proved that articles have been further manufactured.

Rules and regulations for operation of the tax would be prescribed by the Commissioner of Internal Revenue with the approval of the Secretary of the Treasury. The sales tax would apply until June 30, 1934.

THE annual spring group meeting of committees of the American Society for Testing Materials was held at the Cleveland Hotel, Cleveland, March 7 to 11. About 400 were registered for the meetings of about 20 main committees. Including section and sub-committees, upward of 100 meetings were held during the five days.

New standards were offered and acted on by several of the committees, as well as revisions of existing ones. Some new sub-committees were formed to investigate important projects and programs.

A feature of the week's program was a symposium on rubber, in two sessions held on Wednesday, March 9, followed by a dinner.

Arrangements for the week's activities were made by the Cleveland district committee, of which H. A. Schwartz, National Malleable & Steel Casting Co., Cleveland, is chairman.

Results of the meetings of a few of the main committees follow:

Committee on Steel Acts on Standards

Committee A-1 on Steel took action to recommend revisions of the various tentative specifications for fabricated pipe including electric resistance-welded pipe, electric forge-welded pipe and electric fusion-welded pipe. In the case of the specifications for electric fusion-welded pipe a new specification has been prepared for pipe up to sizes 30 in. in diameter, the present tentative specifications, which are being revised, covering pipe over 30 in. in diameter.

The need for specifications covering wires and cables for suspension bridges and similar structures was made evident, and this subject was referred to the sub-committee on structural steel for bridges, buildings and rolling stock for consideration and report.

The subject of drawing up specifications for alloy steel for pipe for use in cracking steels for gasoline was referred to the committee for consideration through the Association of American Steel Manufacturers.

The sub-committee on valves, flanges and fittings for high-temperature service discussed materials for use at temperatures above 750 deg. F. (400 deg. C.). The present standard specifications for castings, pipe flanges and fittings, pipe and bolting materials contemplated temperatures up to 750 deg. F. (400 deg. C.).

Study of Impact Tests for Cast Iron Nearly Completed

Sub-committee XV on impact testing of Committee A-3 on Cast Iron reported on the progress of its investigation of impact testing of cast iron. Twenty-four sets of test bars have been secured from various cooperating foundries in the United States. These bars cover practically all the commercial classes of cast iron, and have been used for static tests and various impact tests. Several thousand tests have been

made and the data are very nearly complete.

The expectation is that final results will be obtained within the next two months at which time a report will be drafted to be submitted to the society. The sub-committee's work represents probably the most comprehensive investigation of the physical properties of cast iron ever attempted in the United States.

Committee A-3 has realized the need for classification of types of cast iron and the development of specifications for these various classes. During the past year sub-committee VI on general castings was organized to carry on the work. It has suggested a set of classifications which have been approved by the main committee, but additional data are required before specifications can be developed. This will be furnished by sub-committee XIV on correlation of test bar and casting through the cooperation of the Gray Iron Institute, which has offered data that it has accumulated.

What Is Wrought Iron Quality?

Committee A-2 on Wrought Iron issued a statement outlining progress in the preparation of a report describing what constitutes quality in wrought iron. A questionnaire has been sent to each member of the committee. The questionnaire is classified into topical groups and divisions covering physical properties, chemical analysis and structural characteristics. When this work is completed, it will not in any sense be a specification, but merely a guide to users of wrought iron which, it is hoped, will help them to determine the quality of material they purchase.

The study of the effect of elevated temperature on wrought iron is under consideration in cooperation with the Joint A.S.T.M.-A.S.M.E. High Temperature Research Committee.

The main committee referred the subject of preparation of specifications for wrought iron rivets to a sub-committee which, if at all possible, is to have recommendations in the hands of Committee A-2 in time for the June Meeting.

Activities of Committee on Corrosion

The Committee A-5 on Corrosion of Iron and Steel is making an investigation to determine the best selection or evaluation of various qualities or types of iron and steel for services where corrosion is a factor, and to set up standards for materials or for metallic coatings adequately to meet the corrosion conditions. Various sub-committees of Committee A-5 held meetings last week. The original investigative work on atmospheric exposure of black sheet materials has been largely completed and summarized in other years but one set of test samples is still being observed at the Annapolis location.

An important corollary of this is the investigation of the same materials under immersion conditions in various types of water. Some conclusions have been reached in the past, but much of this important work still is in progress and it will be some time in the future when conclusions may safely be drawn. Most interesting extensions of the original work are in progress relating to the study of plate materials and rivets in sea and

other water conditions prevalent in shipping service, including some test installations in actual vessel hulls.

The committee is still actively interested in the study and development of tests of an accelerated or quick-time nature by which judgment as to the suitability of materials for corrosion service may be more rapidly obtained. Unfortunately, in spite of much effort along these lines, there appear to be as yet no satisfactory accelerated tests.

A recent activity of the committee is the important investigation of possible embrittlement of structural steel members as a result of the operations incidental to application of galvanized protective coatings. It is of particular importance in connection with towers and accessories in electrical transmission. The results of the investigation will probably be given to the society at the June Meeting in Atlantic City.

New Method for Tension Tests of Pipe and Tubing

The section on tension testing of Committee E-1 on Methods of Testing agreed upon certain revisions of the present tentative standards for tension testing of metallic materials. The major revision is the addition of new tentative methods of making tension tests of pipe and tubing.

The section on testing thin sheet metals of Committee E-1 agreed upon a test specimen which has been recommended for adoption as standard. This group is now actively at work preparing specifications for methods of making tension tests on sheet materials, and is also giving consideration to various other tests which can be used in determining their quality. The work is to be done before the next meeting in June.

Impact tests are being studied by a sub-committee of Committee E-1 on Methods of Testing. A questionnaire is being sent out to individuals both in this country and abroad to determine who is now using the impact test and for what purpose.

Unfilled Steel Tonnage Again Declines

The eleventh consecutive monthly decline in the unfilled orders of the United States Steel Corp. occurred in February. The drop from January was 102,521 tons, bringing the total of unfilled orders as of Feb. 29 to a new low figure of 2,545,629 tons. The present figure is the smallest since the United States Steel Corp. began reporting its unfilled tonnage.

Unfilled orders at the end of each month since 1929 follow:

	1932	1931	1930
	Tons	Tons	Tons
January	2,648,150	4,132,351	4,468,710
February	2,545,629	3,965,194	4,473,748
March	3,995,330	4,571,653	
April	3,897,729	4,354,220	
May	3,620,452	4,059,227	
June	3,479,323	3,968,064	
July	3,407,816	4,022,655	
August	3,169,457	3,580,204	
September	3,144,833	3,424,338	
October	3,119,432	3,481,763	
November	2,933,891	3,639,636	
December	2,735,353	3,943,596	

British Steel Makers Urge Further Tariff Protection

United Kingdom Pig Iron Trade Slowly Reviving But Steel Is Dull—Continental Situation More Acute

LONDON, ENGLAND, March 14 (By Cable).—British steel makers are urging further tariff protection. The advisory committee will consider the question after the disposal of the abnormal duties which are due for revision shortly.

The pig iron trade is slowly reviving, but steel is dull. Continental steel business is affected by violent fluctuations in exchanges and business is virtually idle. Belgian prices are tending lower owing to lack of demand.

French industrialists are hoping that an organization of industry will check the decline. The French position is acute, with unemployment rising. German mills are on a short-time basis and some are rolling for stock. The unemployed in Czechoslovakia have increased to over half a million.

All Welsh tin plate makers have now agreed to the plan for a restriction of output. The minimum price is to be 16s. per base box, f.o.b. works port. The initial agreement is to run three months from Feb. 25. Pool payments will be 2s. per box for exceeding quota, starting April 18, and a bonus of 2s. will be paid to those mills which fall below their quota. The agreement provides that the plan

shall remain in operation for a minimum of 15 months.

United Kingdom exports of pig iron in February were 90,000 tons, of which 10,000 tons was shipped to the United States. The total of iron and steel exports was 140,000 tons.

Pittsburgh L.C.L. Rates to Be Reduced May 2

Freight rates on less-than-carload lots of iron and steel products in Official Classification territory will be placed upon a uniform basis, effective May 2, according to a decision reached recently by railroad traffic executives. The new rates, which have been sought by Pittsburgh district steel shippers since advances were put into effect on Jan. 3, are expected to remove discriminations existing against the Pittsburgh district as compared with Bethlehem, Coatesville, Johnstown, Steelton and other Eastern shipping points.

Under the new agreement less-than-carload commodity rates amounting to 40 per cent of first class rates will apply on less-than-carload lots of steel products for shipment to the east of Pittsburgh as well as to the west. The present classifications are equivalent to 50 per cent of first class rates in many instances. Existing less-than-carload commodity rates applying to a limited number of points will be adjusted to the new basis.

The new rates provide for a reduction of 10.5c, a 100 lb. in the less carload rate from Pittsburgh to New York, the new rate to be 41.5c. a 100 lb., compared with 52c. The rate on movements from Johnstown to New York will be 37.5c., allowing only a 4c. advantage over Pittsburgh, as compared with 14.5c. previously. Corresponding revisions will be made in the rates from other points.

British Prices, f.o.b. United Kingdom Ports

	Per Gross Ton
Ferrromanganese, export	£9 6s.
Billets, open-hearth...	5 7½ to £5 12½s.
Black sheets, Japanese specifications	9 12 6d to 9 15
Tin plate, per base box	0 16
Steel bars, open-hearth...	7 17½ to 8 7½
Beams, open-hearth...	7 7½ to 7 17½
Channels, open-hearth...	7 12½ to 8 2½
Angles, open-hearth...	7 7½ to 7 17½
Black sheets, No. 24 gage	8 0 to 8 10
Galvanized sheets, No. 24 gage	9 10

Continental Prices, f.o.b. Continental Ports

	Per Metric Ton, Gold £ at \$4.86
Billets, Thomas	£2 6s.
Wire rods, No. 5 B.W.G.	5 5
Black sheets, No. 31 gage, Japanese	11 5
Steel bars, merchant...	2 9
Beams, Thomas	2 9
Angles, Thomas, 4-in. and larger	2 9
Angles, small	2 11
Hoops and strip steel over 6-in. base	3 7 6d
Wire, plain, No. 8...	5 7½
Wire, barbed, 4-pt., No. 10, B.W.G.	8 15

The Combustion Engineering Division of the Association of Iron and Steel Electrical Engineers will hold an all-day technical session on Thursday, March 24, at the Ohio Hotel, Youngstown. A symposium on the mechanical, combustion and electrical developments in the iron and steel industry will occupy the entire time of this meeting.

High Level of Employment Maintained by Steel Corporation in 1931 in Face of Low Output

UNITED States Steel Corp., in its pamphlet report for 1931, states that its rated capacity, as of Jan. 1, 1932, was 21,846,700 gross tons of pig iron and ferromanganese, 27,841,300 tons of steel ingots and castings and 19,647 tons of finished steel products. Its production in 1931 was 7,021,507 tons of pig iron, ferromanganese and spiegeleisen, 10,082,398 tons of steel ingots and 7,196,017 tons of finished steel products.

The 1931 production declined 45 per cent in pig iron, 39.7 per cent in ingots and 38 per cent in finished steel products. There was also a decline of 38 per cent in output of Portland cement. Compared with 1929, the Cor-

poration's production of finished steel products decreased 8,106,652 tons, or 53 per cent, while cement output declined 39 per cent.

Continuous Price Decline Since 1924

The average price received by the Corporation on its domestic shipments of finished steel products during 1931 was \$4.60 per ton less than the average for an equal tonnage of similar products respectively shipped in 1930, while the average price received for export shipments was \$2.84 per ton less than in the preceding year. The Corporation publishes a trend of prices received for its products in recent years, using the average figure

for 1923 as the base. The comparison is as follows:

Year	Domestic, Per Cent	Export, Per Cent
1923 (Base)	100.0	100.0
1924	102.0	97.2
1925	95.3	90.4
1926	94.1	85.7
1927	91.2	82.7
1928	89.0	78.6
1929	88.6	82.0
1930	83.8	82.5
1931	78.8	79.5

Last year the Steel Corporation expended a total of \$59,461,294 for repairs, maintenance and replacements. In addition to this there was appropriated from earnings for exhaustion of natural resources and for deterioration and obsolescence of plants and properties the sum of \$48,276,008, or a total investment of \$107,737,302. This was 30.4 per cent less than was expended similarly in 1930.

During the year there was a net reduction of the bonded and mortgage debt amounting to \$2,932,816, leaving the outstanding bonded debt as of Dec. 31, 1931, at \$98,887,294, of which \$371,500 was on deposit for redemption of bonds.

High Percentage of Employment

The Corporation shows that its average percentage of employment of a full normal working force was 84 per cent. The best employment was in the first quarter at 93 per cent. There was a decline to 89 per cent in the second quarter, to 78 per cent in the third quarter and to 76 per cent in the fourth quarter. The total working force was at its peak in the first quarter with an average of 226,044 men. The bottom occurred in the fourth quarter, when an average of 182,156 men was employed. The number of employees working full time was 76,260 in the first quarter, 61,524 in the second quarter, 41,019 in the third quarter and 35,674 in the fourth quarter. The number working part time was 149,784 in the first quarter, 154,445 in the second quarter, 149,512 in the third quarter and 146,482 in the fourth quarter.

The Corporation's payroll for the year was \$266,871,413, compared with \$391,271,366 in 1930, a decline of 31.79 per cent. The average earnings per employee per day last year were \$5.90, compared with \$5.99 in 1930. The report states that all salaried employees receiving over \$1,800 per year were reduced from 10 to 15 per cent on Aug. 15, while on Oct. 1 all salaried men not affected by the former adjustment were reduced 10 per

PRODUCTION OF RAW, SEMI-FINISHED AND FINISHED PRODUCTS BY SUBSIDIARY COMPANIES OF UNITED STATES STEEL CORPN. IN 1931 AND 1930

	Products	1931	1930	1931 Decrease
		Tons	Tons	Tons Per Cent
Ores Mined:				
In the Lake Superior region (iron ore)		11,725,480	21,352,307	9,626,827 45.1
In the Southern region—Alabama (iron ore)		1,762,749	2,796,416	1,033,667 37.0
In Brazil, S. A. (manganese ore)		97,328	134,044	36,716 27.4
In Tennessee (zinc ore)		15,159	12,336	2,823* 22.9*
Total		13,600,716	24,295,103	10,694,387 44.0
Limestone quarried—Includes dolomite, cement rock, shale and fluorspar		7,673,718	14,611,927	6,938,209 47.5
Coal Mined:				
For use in the manufacture of coke		10,760,968	19,149,469	8,388,501 43.8
For steam, gas and all other purposes		5,018,330	6,238,796	1,220,466 19.6
Total		15,779,298	25,388,265	9,608,967 37.8
Coke Manufactured:				
In bee-hive ovens		15,588	51,390	35,802 69.7
In by-product ovens		7,925,244	13,061,932	6,036,748 46.2
Total		7,040,832	13,113,382	6,072,550 46.3
Blast Furnace Production:				
Pig iron		6,928,630	12,579,143	5,650,513 44.9
Spiegel, ferromanganese and ferrosilicon		92,877	179,190	86,313 48.1
Total		7,021,507	12,758,333	5,736,826 45.0
Steel Ingots Production:				
Bessemer ingots		1,849,280	3,183,279	1,333,999 41.9
Open-hearth ingots		8,233,118	13,543,193	5,310,075 39.2
Total		10,082,398	16,726,472	6,644,074 39.7
Rolled and Finished Steel Products for Sale:				
Steel rails (heavy and light T and girder)		596,132	947,697	351,565 37.1
Blooms, billets, slabs, sheet and timplate bars		568,948	820,806	251,858 30.7
Plates		601,714	1,360,685	758,971 55.8
Heavy structural shapes		563,886	976,131	412,245 42.2
Merchant bars, hoops, skelp, light shapes, etc.		1,383,267	2,133,549	750,282 35.2
Tubing and pipe		677,619	1,294,621	617,002 47.7
Wire rods		128,862	160,672	31,810 19.8
Wire and wire products		778,883	1,034,247	255,364 24.7
Sheets (black and galvanized) and timplates		1,069,901	1,556,369	486,468 31.3
Finished structural work		444,233	758,795	314,562 41.5
Angle splice bars and all other rail joints		118,711	182,147	63,436 34.8
Spikes, bolts, nuts and rivets		28,082	45,401	17,319 38.1
Axes		9,579	49,913	40,334 80.8
Steel car wheels		38,386	64,155	25,769 40.2
Sundry steel and iron products		187,814	224,077	36,263 16.2
Total		7,196,017	11,609,265	4,413,248 38.0
Miscellaneous Products:				
Zinc		27,528	54,532	27,004 49.5
Sulphate of iron		16,515	25,148	8,633 34.3
Fertilizer—basic slag		18,500	26,199	7,699 29.4
Ammonia (in sulphate equivalent)		129,634	220,587	90,963 41.2
Benzol products		112,264	202,758	90,494 44.6
Gypsum		73,258	121,865	48,607 39.9
Portland cement		15,050,996	24,294,154	9,243,158 38.0

*Increase.



WILLIAM A. IRVIN

PRÉDICTIONS and conjectures of several weeks' standing were suddenly silenced last week by an announcement from the executive offices of the United States Steel Corp., at 71 Broadway, New York, that William A. Irvin would succeed James A. Farrell as president of the world's largest steel-making company, on April 19. Following the publication in January of Mr. Farrell's forthcoming retirement, great interest had been attached to the naming of his successor.

What did the Steel Corporation intend to do? Although advanced from the ranks of the operating personnel of the steel industry, Mr. Farrell had long been considered one of the great salesmen of the industry. Did the country's premier steel company seek some one from the sales departments of the steel industry to succeed him, or was it looking for an operating man? Many persons, particularly in New York financial circles, believed that the directors of the Steel Corporation would go outside of the industry and find a successor to Mr. Farrell from among those industrial executives who have achieved success in some entirely different field. Mr. Irvin's appointment has confirmed the opinion of those who believed the Steel Corporation was seeking an operating man.

Last September the quiet and reserved dining tables of Pittsburgh's Duquesne Club were enlivened by the report that William A. Irvin was going to New York as vice-president of the United States Steel Corp. The members of the Duquesne Club, which has been the mecca of Pitts-

William A. Irvin to Become President of Steel Corporation

More Intensive Drive for Operating Economies Indicated by His Selection for the Position

burgh's steel men for three generations, all knew William A. Irvin, and most of them addressed him by his Christian name or more familiarly as "Bill." They had known him since November, 1925, as vice-president in charge of plant operations for the American Sheet & Tin Plate Co., and for 20 years prior to that time as assistant to the operating vice-president. They knew him also as one of the most able steel operators in the Pittsburgh district, and as a genial companion at the lunch table and on the golf course. But they were not surprised that the Steel Corporation had found a bigger job for their old friend that would require his services at 71 Broadway. Many of them were not hesitant to predict that even more important duties and responsibilities were being planned for him.

On that same warm September day the citizens of the little town of Indiana, Pa., also heard the news of William A. Irvin's appointment without surprise. For they had known him well, as only small towns can know their native sons who have won success in the realm of business and industry. Mr. Irvin was born on Dec. 7, 1873, and after attending grammar school at Indiana, he became a telegraph messenger in that city. Supplementing his work with night courses at the Indiana (Pa.) State Normal School, he became a telegraph operator for the Pennsylvania Railroad in 1888, and quickly advanced to the position of assistant freight and ticket agent in the town of his birth. In 1895 he went to work for the P. H. Lauffmann Co., Ltd., Apollo, Pa., manufacturer of sheets and tin plate, and rapidly advanced to the superintendency, a position he held when the company was taken over by the American Sheet Steel Co. in 1900. At that time he was transferred to the company's general offices in New York, where he remained until the American Sheet Steel Co. was merged with the American Tin Plate Co. to form the present American Sheet & Tin Plate Co. in 1904. Mr. Irvin then returned to western Pennsylvania to become assistant to the new company's operating vice-president, with headquarters in the Frick Building at Pittsburgh.

It was during the next 20 years

that Mr. Irvin familiarized himself with the great industry which was later to choose him for its most important executive position. The mills of the newly formed American Sheet & Tin Plate Co. were widely scattered throughout eastern Ohio, western Pennsylvania and West Virginia. Mr. Irvin's duties involved the consolidation of their operations. A few were discontinued; others were modernized. At Vandergrift, Pa., was an open-hearth plant which was utilized to supply a portion of the large and exacting steel requirements of these many sheet and tin producing units. The Steel Corporation's great development at Gary was under way; sheet and tin mills were built there. Here was located the industry's largest tin plate mill, which first utilized the principles of the continuous process for rolling flat steel. The sheet and tin plate industries were reaching maturity. Cost reduction was preeminent. During Mr. Irvin's régime in key operating positions, the Sheet & Tin Plate company became one of the Steel Corporation's most profitable subsidiaries. Further development of the continuous rolling process has made way for even greater economies. These principles are being applied to all branches of the steel industry. It is believed that no one in the industry has a better understanding of its problems than William A. Irvin.

Although always recognized as a stern taskmaster, Mr. Irvin has gained the respect and confidence of labor by the maintenance of a constructive wage policy during his years with the American Sheet & Tin Plate Co. He was largely responsible for the inauguration of the company's method of wage payments, which differs from the Amalgamated scale in a number of features designed to give sheet and tin mill workers, both skilled and unskilled, a stable income. This has entirely freed the company from wage disputes and has enabled it to pay a comparatively high scale. Under these circumstances, the appointment indicates that the Steel Corporation's fair and friendly dealings with the working man will be continued.

Mr. Irvin's appointment would indicate that the directors of the Steel

(Concluded on page 694)

Scrap Trade Charges Bankers Are Still Restricting Credit

Benjamin Schwartz, Institute's Director General, Addresses President Hoover During Annual Meeting in Washington

CHARGES that bankers are hampering the recovery of business by restrictive lending policies and are thus threatening to defeat the efforts of the Federal Government to ease the credit situation were laid before President Hoover by Benjamin Schwartz, director general of the Institute of Scrap Iron and Steel, which held its fourth annual convention at the Mayflower Hotel, Washington, March 8, 9 and 10. Mr. Schwartz and the members of the board of directors of the institute were received by the President on Wednesday.

The President told the scrap men that adequate funds have been placed at the disposal of the bankers through the Reconstruction Finance Corporation and other agencies with which to extend credit to the small business men of the country, and that he would like to have the names of banks that were not cooperating in this program.

Mr. Schwartz stated that the restriction of bank credit has prevented the collection of "valuable raw materials which constitute an excellent investment today because of the fact that they are at the lowest prices in the history of the industry." He also stated that hundreds of thousands of men might be profitably employed in the collection, preparation and distribution of scrap but for this restrictive policy.

The scrap institute's appeal to the President is said to have been corroborative of similar reports from other branches of business, and it was accorded front page space in many daily newspapers throughout the country. Washington correspondents of the daily press had been intimating for several days that President Hoover was about to bring some pressure to bear upon banks that were not cooperating with the Government in easing the credit structure.

Says Business Men Have Lost Confidence in Bankers

At the banquet of the scrap institute Thursday evening, Charles F. Abbott, executive director of the American Institute of Steel Construction, who had just returned from a trip of several weeks to the Pacific Coast, said that everywhere he went he found that bankers had lost the confidence of business men.

United States Senator Gerald P. Nye of North Dakota, who was also

one of the banquet speakers, blamed big business and the bankers for a considerable part of our present economic difficulties. Senator Nye criticized the bankers for the policies they had pursued in making foreign loans and for flotation of stock securities of American corporations on "watered" valuations.

Merle Thorpe, editor of *Nation's Business*, and Mr. Schwartz were also speakers at the banquet.

H. D. Moskowitz Reelected President

Herman D. Moskowitz, of the Schiavone-Bonomo Corp., New York, was reelected president. The following are the new vice-presidents: Myron A. Cohen, M. Cohen & Son Co., Cleveland; Frank Parker, Iron & Steel Products, Inc., Chicago; Charles Dreifus, Charles Dreifus Co., Pittsburgh; Ben Cohen, Louis Cohen & Son, Wilkes-Barre, Pa., and B. P. Williams, Hickman, Williams & Co., Inc., St. Louis. Phil W. Frieder, David J. Joseph Co., Youngstown, was elected chairman of the executive committee; Thomas F. Kelly, Brooklyn, and Walter Erman, Erman-Howell & Co., Chicago, were elected treasurer and secretary respectively.

The following members were elected to the board of directors for a three-year term: Ben Cohen, Wilkes-Barre; Michael V. Bonomo, Jersey City; Charles Dreifus, Pittsburgh; William M. Hilb, Cincinnati; Frank Parker, Chicago; B. P. Williams, St. Louis; Walter Erman, Chicago; Harry Grant, Detroit; Lee J. Workum, Portsmouth, Ohio. The following were elected members of the board to fill unexpired terms created by vacancy on the board: Fred Wimmer, Pittsburgh; Joseph Paper, St. Paul, Minn.; and H. Cohen, Chelsea, Mass.

Confer on Scrap Classification

A conference on revision of classifications of iron and steel scrap were attended by representatives of the American Railway Association, National Association of Purchasing Agents and the steel companies. Alexander Galt, of the Department of Commerce, who presided, was authorized to appoint a standing committee, consisting of representatives of the producers and consumers of scrap and of the scrap trade, to supervise the work of revising the standard classification which was adopted several years ago in cooperation with



the Department of Commerce. One of the chief points of discussion was alloy steel scrap, which is becoming a more serious factor for all scrap melters.

A meeting of those interested in export sales of scrap was addressed by Luther Becker, chief of the Iron and Steel Division of the Department of Commerce, in which he described the scrap requirements of foreign countries. It was decided to form an export corporation, and Mr. Schwartz was authorized to proceed with plans.

The institute adopted a resolution urging that members give preference to members of the institute in their scrap dealings. Another resolution provided for revision of the by-laws to admit as associate members the producers of scrap and the manufacturers of equipment used by the scrap trade. Another resolution provided that compulsory arbitration of disputes under the rules of the institute shall apply hereafter only to amounts not in excess of \$3,000.

W. W. MacMillan Receives Award

It is the custom of the Institute of Scrap Iron and Steel to give an annual award to the individual who shall have rendered during the year outstanding service to the scrap industry. This award was presented to W. W. MacMillan, purchasing agent of the National Malleable & Steel Castings Co., Cleveland, and chairman of the iron and steel committee of the National Association of Purchasing Agents. Mr. MacMillan has worked very closely with the scrap institute in the formulation of better policies of scrap trading. A cup donated by the institute's director general, which is awarded annually to the chapter of the institute that has done the most distinctive work, was presented to the New Jersey chapter. The Cincinnati chapter was given honorable mention. The New Jersey chapter presented an engraved plaque to Abraham Isaac of Elizabeth, N. J., honorary chairman of that chapter, for outstanding work he has done in behalf of the New Jersey scrap trade.

Output of galvanized sheet metal ware in January rose to 87,096 doz. pieces from 72,558 doz. in December, according to the Bureau of the Census. Shipments increased to 88,382 doz. from 63,163 doz.



Motor Car Output Continues to Lag Pending Display of New Fords

DETROIT, March 14.

THE first Ford V-eight to be assembled came off the line at the Rouge plant last Thursday and was stamped No. 1 by Henry Ford. It is expected that regular production of the new cars will be started some time this week, although operations will get under way slowly. Despite reports that a definite schedule is contemplated this month, there is slight likelihood that plans have reached the stage where any quota can be set up with assurance that it will be attained. Stocks on hand are considerably out of balance; that is, carburetors and gas tanks, for example, have been manufactured in larger quantities than other parts. Steel releases have been small and for quick delivery; nothing approaching requirements for volume production has been ordered. Several weeks ago it was believed that sufficient steel already had moved to the Ford company and to leading suppliers for 50,000 cars, but revised estimates put the figure nearer 25,000 cars.

Just when the V-eight and the four will be shown is still a mystery. Detroit continues a hot-bed of stories about various causes of last-minute delays in the launching of Ford activities on a far-flung basis, but the truth is that the manufacture of enough cars for display purposes in leading cities is being rushed as rapidly as possible and the public announcement is not likely to be postponed longer than another week or two. Meanwhile, Ford is not building up steel stocks, preferring to rely on the mills to keep his departments operating from day to day. For instance, last week it was necessary for a steel maker 300 miles distant to dispatch an overnight truck shipment of steel to Dearborn to prevent one department from closing down for lack of material. In many cases it is impossible for steel companies to tell from

Excluding Ford, March production is likely to be about the same as in February. First quarter's assemblies for the entire industry estimated at 375,000 cars.

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National Automobile Chamber of Commerce puts February output at 118,559 units.

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The first Ford V-eight came off the assembly line on March 10.

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releases whether stock is intended for replacement parts on model A or for the new car; it must be remembered that the replacement trade is a sizable business in itself. Some departments at Rouge are understood to have worked only two days last week, with three days scheduled for this week. Production of eight-cylinder motors is proceeding slowly. With a comparatively small stock of frames on hand, it is believed that when assemblies are accelerated the Murray frame plant at Ecorse will be pushed day and night to supply branch assembly plants, while the frame department at Rouge likewise will be hard pushed. Ford employment at Dearborn still hovers around the 70,000 mark.

Chevrolet to Increase Operations

Although no figures have been issued, Chevrolet is reported to have made 35,000 to 40,000 cars in February, with about the same volume planned this month. The gray iron foundry at Saginaw is preparing to increase its output either late in March or early in April preliminary to a step-up in output by the entire organization. Other General Motors units are said to have relatively light schedules this month. Plymouth has

ordered a 10-day hold-up of steel deliveries originally released for next week, indicating that output of its new line is going ahead slowly. Reo will have its new car in the \$1,000 class ready shortly. The five thousandth Rockne was shipped on March 8; production of the "65" models at the local plant is 200 a day. DeSoto made 4452 units in February, against 2282 in the same month of 1931, while March will show a gain over last month.

Steel-Laden Boat Stuck in Ice

Believing it safe to start water delivery of steel earlier than usual this year because of the mild weather, a Cleveland steel mill shipped a cargo of steel the past week to Detroit in the Lake freighter Fellowcraft, owned by the Nicholson company. On the way here the vessel became wedged in an ice floe at the foot of the Detroit River and a rescue squad had to take food to the crew. The vessel has not yet been able to complete its journey. The sudden cold spell, with snow and near-zero temperatures, was responsible for this turn of affairs. Incidentally, companies which regularly stock pig iron to carry them through the winter until Lake navigation opens in the spring are finding that reduced operations in recent weeks will result in their carrying over from one to two months' supply, whereas a year ago they barely had enough pig iron to tide them over until the first boat came through with fresh stocks.

To Place Steel Contracts

Chrysler Corp. is expected to close second quarter steel contracts this week. The Ford company is understood to have relaxed somewhat its pressure for still lower steel prices. The fact that it has not asked for new quotations, being willing to go along on the basis of those taken some time ago, is regarded as a favorable sign.

... OBITUARY ...

CHRISTOPHER C. BRADLEY, JR., died suddenly on March 8 in the plant of C. C. Bradley & Son, Inc., Syracuse, N. Y., of which company he was president.

Mr. Bradley was born in Syracuse in 1873. After completing a course in public school and a year in high school, he completed a two-year course in machine shop practice at the Chicago Manual Training School. He then made arrangements to prepare for the study of engineering at Cornell University, but illness interfered with his plans and he went into business with his father in Syracuse. When the Bradley Co. was incorporated in 1894, Mr. Bradley was made vice-president, and later, in 1896, when the firm of the present name was incorporated, he became secretary and treasurer. He succeeded his father as president in 1916.

Mr. Bradley was widely known, not only through the development of his own company and its products, which were power hammers, forges and automobile hardware, but also for his civic and social activities. He was commissioner of public safety of Syracuse from 1927 to 1929, and was a member of many clubs and fraternal organizations.

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WILLIAM L. AUSTIN, formerly president of the Baldwin Locomotive Works, died at his home in Rosemont, Philadelphia, on March 10, after a brief illness. He was born in Philadelphia on Sept. 22, 1852. After his graduation from high school, he entered the United States Patent Office as a draftsman in 1868. The next year he joined the Kensington Steam Engine Works and in 1870 was employed by the company which he later headed. Mr. Austin was elected vice-president and chief engineer of the Baldwin Locomotive Works in 1886. He served as president from 1910 to 1911 and as chairman of the board the following year. He was the inventor of a number of safety devices for locomotives. He was identified with the locomotive company for 60 years.

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HORACE E. WHITNEY, of the Dover Stamping & Mfg. Co., Cambridge, Mass., died after a short illness at his home in that city on March 9, aged 60 years.

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JOHN M. SELLERS, president, Sellers Railway Supply Co., Chicago, died March 14, after an illness of several months. He was born in 1865 at Keokuk, Iowa, and went to Chicago in early youth. Mr. Sellers was one of the original explorers of the Mesabi range and was a member of the first international golf team of America which played against England.



C. C. BRADLEY, JR.

tained during a period of normal operations, with adjustments for current market conditions. The basis of pricing raw materials, supplies and stores is on the average cost plan. This change necessitated a writedown of inventories as of Jan. 1, 1931, in the amount of \$699,559.72, which was deducted from earned surplus and enables the inventory values to be more conservatively stated than heretofore. Permission has been granted by the Bureau of Internal Revenue to make the change operative for tax purposes.

Value of the corporation's sales during 1931, exclusive of inter-company shipments, was \$45,360,919, compared with \$66,102,246 in 1930. Pig iron production declined from 875,269 gross tons in 1930 to 387,084 tons in 1931, while output of steel ingots dropped from 1,085,098 gross tons in 1930 to 691,853 tons in 1931. Average number of employees in 1931 was 13,572, compared with 17,273 in 1930, and average yearly earnings per employee also dropped from \$1,575 in 1930 to \$1,360 in 1931. Total payroll declined from \$27,202,633 to \$18,461,859.

During the year the machinery of the Tyler Tube & Pipe Co., Washington, Pa., which was purchased by the Wheeling Steel Corpn. in the preceding year, was dismantled and moved to the various plants of the parent corporation. By so doing supervision of the operations of the Tyler company was placed under better control, and a saving of freight upon semi-finished materials shipped from the various plants to Washington was realized.

Laws Will Bar Foreign Purchases by Government

WASHINGTON, March 15.—The President last Wednesday signed a bill directing the Secretary of War to take military and non-military supplies from domestic producers "unless the interest of the Government will not permit." Domestic supplies are to be bought "notwithstanding that such articles . . . may cost more, if such excess of cost be not unreasonable." The Post Office bill, now pending, carries a similar provision as will other supply bills. It is the plan, however, of sponsors of general bills, which would cover purchases for the entire Government, to push them to passage at the present session. Such a law would make unnecessary the insertion of domestic purchase clauses in separate measures.

The American Iron and Steel Institute is now in its new offices in the Empire State Building, New York, having moved last week from 75 West Street.

... PERSONALS ...

A. E. GROVER has been appointed cost director of the Gray Iron Institute, Cleveland. Mr. Grover has been cost consultant of the National Machine Tool Builders' Association since 1928. From 1923 to 1928 he was engaged in cost consulting work and previous to that he had considerable experience in cost accounting work with accounting firms and as controller of the Dunham Co., Berea, Ohio, and as cost accountant of the Geneva Metal Wheel Co., Geneva, Ohio. He is a graduate of Mount Union College. CHARLES A. KLAUS will continue as cost consultant of the institute in the East.

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E. T. CORBUS, until recently vice-president of the Edgar T. Ward's Sons Co., Carnegie, Pa., operator of steel warehouses, has been made president and treasurer of the Udeholm Co. of America, Inc., 342 Madison Avenue, New York, which has been formed to handle United States distribution of hot and cold-rolled steel products, particularly high-carbon spring steel, produced by the Udeholm steel works of Sweden. The Udeholm organization is one of the oldest producers of iron and steel in the world, having been founded in 1668.

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H. E. GRAHAM, who has been assistant vice-president of the American Car & Foundry Co., New York, has been appointed assistant to the president and general traffic manager of the Jones & Laughlin Steel Corp., Pittsburgh. In his latter capacity he succeeds the late F. A. Ogden. Mr. Graham was formerly identified with the Pressed Steel Car Co. at Pittsburgh, and will again take up his new duties in that city on April 1.

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W. S. COLEMAN, president, Anniston Soil Pipe Co., was elected mayor of Anniston, Ala., last week.

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GEN. OTTO H. FALK, president, Allis-Chalmers Mfg. Co., Milwaukee, has been elected a director of the Harnischfeger Corp., Milwaukee, to succeed J. O. EATON, of Otis & Co.

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JAMES L. SURPLESS, JR., has been appointed sales manager, Modern Grinder Mfg. Co., Milwaukee. He has been covering Midwest States for the company for a number of years.

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C. E. BIRCH, of the Whitehead Metal Products Co., Boston, and E. J. ROTHEWELL, of the International Nickel Co., New York, discussed the application of nickel to cast iron at a meeting of the New England Foundrymen's Association at Boston on March 9, and WILLIAM SWEET, of the



A. E. GROVER

International Nickel Co., discussed the application of nickel in non-ferrous alloys.

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L. C. ROSS has been made a director of the Ross Gear & Tool Co., Hartford, Conn., succeeding H. A. DICK.

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JAMES S. FRASER, since 1920 general superintendent of the Trumbull-Cliffs Furnace Co., Warren, Ohio, has tendered his resignation effective April 1, to join the staff of H. A. Brassert & Co., Chicago. He is to take an active part in the company's consulting and operating work abroad. A. J. HULSE, heretofore assistant chief engineer of the Brassert company, has been appointed chief engineer, succeeding FREDERICK WILLE, who has resigned. C. E. DOUGAN, who has been chief draftsman, has become assistant chief engineer.

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E. H. MORRELL, for the past 11 years identified with the manufacturing and distribution departments of the National Radiator Corp., Johnstown, Pa., has been made purchasing agent.

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J. C. FITZPATRICK, formerly district sales manager at Cleveland for the Chicago Pneumatic Tool Co., has been transferred to the New York district office.

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E. W. PAGE, manager industrial X-Ray research department of the General Electric Co., Schenectady, will speak on "The Application of X-Ray Examinations to the Products of the Foundry Industry" at a meeting of the Pittsburgh Foundrymen's Association, to be held at the Fort Pitt Hotel, Pittsburgh, on March 21.

ERNEST T. WEIR, chairman of the National Steel Corp., Pittsburgh, has been appointed chairman for Pennsylvania of the American Legion's campaign to increase employment. Among the sponsors of the campaign in that State is H. B. RUST, president of the Koppers Co., Pittsburgh.

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C. W. ROSS, of the Philadelphia office of the C. O. Bartlett & Snow Co., Cleveland, has been transferred to the New York office, where he will be associated with W. H. NORRINGTON, the New York manager, in serving the Eastern territory.

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JOHN D. NICKLIS has resigned as sales manager of the Shaw Electric Crane Co., Inc., Muskegon, Mich.

British Steel Output Gained in February

LONDON, ENGLAND, March 14.—February output of steel ingots was 480,600 gross tons, compared with 429,700 tons in January. The February pig iron total, at 318,100 tons, was lower, however, than the January total of 332,400 tons. These figures compare with the average production per month, in gross tons, of iron and steel in each of the last five years, as follows:

	Pig Iron	Steel
1913	855,000	638,600
1928	550,800	710,000
1929	632,400	804,600
1930	516,400	608,200
1931	313,180	431,300

Illinois Waterway Is Near Final Work

The final contract on the Illinois waterway will be let about April 1. This is for a retaining wall at Joliet, Ill. The Illinois link in the Lakes-to-Gulf waterway, work on which was started in 1908, will complete this inland waterway. The State of Illinois originally appropriated \$20,000,000 for the work. The Sanitary District of Chicago has spent \$70,000,000, and the Federal Government appropriated \$7,500,000 when it took over the Illinois link.

Electric Hoist Business Gained in February

Members of the Electric Hoist Manufacturers' Association report that the number of hoists ordered during February increased 75 per cent, compared with the previous month, and the value of such orders increased 62 per cent. Shipments were 38 per cent greater in February than in January.

• • • E D I T O R I A L

Mr. Ford Has the Next Move

IT is now two weeks since Mr. Ford made the noteworthy announcement to the public concerning his new plans for production and the effect that their carrying out might have in aiding business recovery and the stimulation of production.

We hope that there will not be too long a delay between the announcement and the receipt of tangible evidence that these plans are at least under way. Public sentiment at the present time is such that both promises and prophecies are quickly discounted if there is a long wait for signs of performance.

Motor cars, on the large scale that Mr. Ford intends to make them in 1932, cannot be made without first placing orders for materials with which to build them. As yet the steel industry has had no particular evidence of such orders.

Some weeks, at best, must elapse between the firing of the starting gun, in the form of material orders, and the availability of the new models. Mr. Ford owes it to his competitors, as well as to the public, to cut this elapsed time to a minimum. Otherwise his announcement may serve the opposite purpose intended and delay, rather than expedite, recovery. For many prospective buyers of low-priced cars are undoubtedly waiting to see what the new Ford looks like.

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Small Shop Cooperation

normally strict competitors.

None of these shops in question are able to secure enough work to run more than a few days at a time. Most of them have cut their working forces to the bone. As a consequence, when one of them gets an order of size, it immediately becomes necessary to take on more men in order to make satisfactory delivery.

If shop A is so situated that it must enlarge its working force temporarily, and shop B is doing little or nothing, the word is passed and the owner and foremen of the latter plant close shop and go to work for the proprietor of the busy shop. Sooner or later the situation is reversed and things are evened up by a return of the call. In this way, a number of these little shops have been able to keep from having to close permanently.

The moral in this seems to be that if you cannot keep the wolf away from the door, you can at least lock the door temporarily and go where the wolf is not.

Latent Buying Power and Recovery

MANY discouraging months of depression have dried up employment, destroyed profits and progressively worn down the income of virtually all classes of our population. The longer these cumulative forces continue at work the greater is despair of recovery. Where, it is asked, will purchasing power come from when the long downswing of the business cycle comes to an end?

The answer is that there have been long and severe depressions in the past and in each case latent purchasing power came into play when hope for a resumption of buying had reached its lowest ebb. Unquestionably numerous business enterprises, as well as many thousands of individuals, still have funds to spend, but are only restrained from doing so by ultra conservatism or fear.

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High Frequency Induction Furnaces

ONE of the most interesting and important developments in the melting of metals in recent years has been the perfection of the high frequency electric induction furnace. Its progress from a laboratory tool to a commercial unit has been closely watched. It has been the aim of the makers of this type of furnace to increase its size so that it would appeal to melters of steel and other metals on a tonnage basis. Considerable success has been attained. From units of 200 to 1000 pounds the size has been expanded to one ton and even two, and several of these are in commercial use here and abroad.

But even these have been quite recently eclipsed. A four-ton furnace is now successfully operating and melting rustless steel scrap in a large steel plant. One of the advantages claimed is that this scrap is remelted without any change in its composition—a signal achievement. This makes it more easily possible to recover this valuable scrap material and assists in solving a problem which has for some time been vexing the rustless steel industry.

Development of electric melting in the United States, both ferrous and non-ferrous, has been one of the outstanding achievements of this century. Including the production of electric ferroalloys, the use of the electric furnace has made available to the engineer high-grade alloy steels which mean so much to industry today. The high frequency furnace is a valuable addition to the other types of furnaces developed earlier. Each one has its role in this expanding industry in which the United States easily leads the world.

COMMENT . . .

The Product Named, "Or Equal"

INTENDING purchasers who write into their specifications the specific names of established products and then add the words "or equal" are committing a solecism. Also, and more important, they are opening the door to the entrance of serious abuses in buying and selling.

There can be nothing equal to the one thing that is best. If the prospective buyer's investigations have gone far enough to determine the one product that will best suit his particular requirements, he should stop after he has named that specific product or trade name. If he feels uncertain about his own investigations, and adds "or equal" as a matter of covering up his own uncertainty, he might better depend upon open specifications without the inclusion of any trade names.

This practice appears to be increasing recently. It should be discouraged. The architect or consulting engineer who adds the phrase "or equal" to a specifically named product is giving the contractor an invitation to switch in materials that can be bought for less, thereby nullifying the selection. Only the contractor benefits, because in the majority of cases the consumer receives inferior quality.

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Hindenburg and "Planned Economy"

WHILE no one factor determined the outcome of the German Presidential election, it is significant that the parties advocating "planned national economy" suffered decisive defeat. A country which has suffered much more want and privation than the United States, and which has seen much greater governmental interference with business, turned thumbs down on both Fascism and Communism, which represent the two leading schools of planned economy.

At this distance it is difficult to discern the true reasons for the action of the German electorate. It may be that observation of national social experimentation at close range caused a loss of faith in the remedial powers of "plans" and a reversion to greater dependence on the ability and common sense of tested leadership. And it is not unlikely that the ever-increasing restrictions imposed by the Government on private enterprise and individual freedom of action brought about a psychological reaction against economic regimentation.

Human nature chafes under too much restraint. It rebels against excessive organization. A virile, energetic and ingenious people would never remain satisfied under a system in which production, distribution and consumption were rationed. It is true that national emergencies sometimes force a wholesale harnessing of national econ-

omy. Such a centralization of control over industry and trade was resorted to in our own country during the war, but it was accepted as a temporary necessity and not as a measure suitable to normal peace-time conditions.

Important as bread is at the present juncture, men do not live by bread alone. Planned economy would hamper initiative and put enterprise at the mercy of politics. It would tie up improvements in machinery and processes in bureaucratic red tape. It would sharply restrict the opportunity for new plants to come into being and later to develop into large industries. It would stifle the incentive for developing new ideas that spell progress.

And new ideas, no less than employment and purchasing power are necessary to industrial growth. But for the opportunity and the competitive pressure to make improvements, Model T's would still be cluttering our highways. Without latitude for individualism and a large measure of freedom for private enterprise, a flourishing economy in a highly developed industrial country is inconceivable.

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New Light on High-Speed Steel

IMPORTANT light has recently been thrown on the composition of high-speed steel. A representative of a large user of this grade of steel stated, in a recent address before a group of steel treaters in New York, that in judging the quality and efficiency of this steel more attention is now paid by his company to the carbon-vanadium ratio or content than to the tungsten. Later a paper, presented at the February meeting of the mining and metallurgical engineers and reviewed in *THE IRON AGE* of Feb. 25, presented the results of an extensive investigation of the effect of vanadium on high-speed steel, fully corroborating the opinion above referred to and supplying much additional information.

It is clear that we must revise to some extent our conception of the effect of composition on the efficiency of this very important product, the discovery of which by Taylor and White some years ago marked an epoch in the steel industry. For many years tungsten has been considered the chief determining element but evidence is now fairly complete that vanadium is equally, and perhaps more, important. Over 20 years ago it was added to high-speed steel up to one per cent, its high cost limiting its use. With the progress in refining methods the cost of vanadium has been reduced so that its use in larger quantities is now possible. The establishing of the fact that a high-speed steel containing 1.50 per cent carbon and 5 per cent vanadium, always in a fixed ratio, possesses improved cutting efficiency and good forgeability over the standard composition as commonly accepted is a large step in advance. It is also a fine demonstration of the results of modern research.

Pennsylvania Railroad May Spend \$68,176,044

WASHINGTON, March 15.—The Pennsylvania Railroad is contemplating an expenditure of \$68,176,044 to complete electrification between New York and Washington and to make improvements at Newark, N. J., Philadelphia and Baltimore, together with an outlay for miscellaneous work. Completion of the electrification project calls for expenditure of \$47,000,000. Expenditures for improvements proposed are allotted as follows: Newark, \$2,000,000; Philadelphia, \$9,822,000, and Baltimore, \$1,500,000. Miscellaneous expenditures proposed involve \$7,854,000. The improvements include construction of terminal facilities in Newark and Philadelphia and construction of highways and facilities in Baltimore.

Details of the plan of the Pennsylvania to proceed with the electrification work and to make improvements were outlined in an application it made last week to the Reconstruction Finance Corporation for a loan of \$55,000,000. The application is now before the Interstate Commerce Commission for consideration.

The total cost of the electrification project is placed at \$110,443,251, consisting of \$81,650,351 for roadway structures and \$28,792,900 for rolling equipment. A balance of \$49,707,064 has not yet been engaged and is made up of \$45,331,975 for roadway structures and \$4,375,089 for rolling equipment.

The petition says that it is in the interest of the Pennsylvania Railroad, labor and industry that the work should proceed during 1932. It explains that schedules were arranged at the beginning of 1931 calling for the complete electrification by March 1, 1933. This, it stated, involved ordering, delivery, erecting and placing in service in a little over two years approximately 68,000 tons of steel; 38,000,000 lb. of copper; 176 locomotives; 6500 miles of wire, 30 new substations, etc.

Wm. A. Irvin to Become President of Steel Corp.

(Concluded from page 687)

Corporation still believe in operating economies; that plant modernization and the inception of more efficient processes can bring the industry out of its present profitless position. Much talk is heard of radical changes in policy. We shall probably know in due time whether such changes are to be made, and if so, what they will be. In the meantime, it can only be assumed that the former sane and stable policies, which in the last 30 years have made the United States Steel Corp. one of the out-

standing industrial enterprises of the world, will be continued. William Irvin's old friends in Pittsburgh recognize his ability and his keen interpretation of the trends of the industry. His new associates in New York have had an opportunity in the last six months to confirm this belief. When he assumes his new position in April, it will be with the good will and best wishes of his associates, as well as of his competitors.

Sheet & Tube Company's Loss \$7,040,899 in 1931

The Youngstown Sheet & Tube Co. reports a loss of \$7,040,899.73 in 1931. The company's operations averaged 32.6 per cent, against 60 per cent for 1930 and 91.5 per cent for 1929. The company's loss last year was equal to \$6.55 per share on its common stock, compared with a profit of \$5.17 per share in 1930. For additions and betterments to properties during the year \$4,877,000 was expended. The betterments were principally in the Youngstown district, including the completion of an electric welding tube mill now in operation at the Brier Hill works, and improvements to the seamless tube mills at the Campbell works.

High Level of Employment Maintained by Steel Corp.

(Concluded from page 686)

cent, as were all wage earners. Transportation companies' employees whose compensation is subject to statutory control and also a few others who were employed under service agreements were excepted. The curtailment in payrolls arising from these reductions amounted to about \$3,991,000 up to the end of December.

With the wage adjustment which went into effect on Oct. 1 last, the average earnings per employee per day in that month were \$5.47, compared with \$5.89 in October, 1923, \$4.60 in October, 1921, and \$2.93 in October, 1913.

Production Far Below Ten-Year Average

With respect to last year's poor record and the outlook for the future, the Corporation's report states: "In 1931 the production of raw steel in the United States declined to about 26,000,000 tons, a reduction of 15,000,000 tons compared with the preceding year and 30,000,000 tons less than were produced in 1929. The production in 1931 was but 46 per cent of the 1929 output. The average annual production during the ten years, 1922 to 1931, inclusive, was 43,000,000 tons, compared with a production of 26,000,000 tons in 1931. It seems reasonable to suppose that on the basis of average demands in the United States for

steel products during the past ten years, the requirements of this country for maintenance and current uses alone, exclusive of development and expansion, should call for steel products in considerably greater tonnage than was consumed in 1931. To meet these demands at an economical cost of production and distribution the properties of the organization are admirably equipped, organized and located."

The total number of stockholders as of Dec. 31, 1931, was 223,272, compared with 189,990 as of Dec. 31, 1930.

The accompanying table gives the production figures of the Corporation in 1931 and 1930 on raw, semi-finished and finished products.

Lumen Bearing Co. Buys Buffalo Plant

The Lumen Bearing Co., Buffalo, purchased at public auction on March 3, the plant, equipment, supplies, patents, etc., of the Buffalo Bronze Die Cast Corp., which has, for several years, been producing bronze and brass castings. The plant purchased by the Lumen Bearing Co. comprises a foundry with a large amount of special equipment, a machine shop with many machine tools and special equipment, a well-equipped core room and cleaning and snagging rooms. Much of the equipment was designed for the production of special castings, such as certain types of worm gears.

Construction Awards Gain in February

A gain of almost 5 per cent in construction awards during February over the low figures of January reflects a normal rise approximating seasonal proportions, according to the F. W. Dodge Corp. Losses from February, 1931, were registered in all four of the major construction classes, with public utilities making the best relative showing.

The \$89,045,800 total in new construction awards for February was divided among the four major construction classes, with \$24,417,300 going to residential building, \$36,347,700 to non-residential building, \$15,633,400 to public works, and \$12,647,400 to public utilities.

"Freezing" of Prices in Time of War Proposed

WASHINGTON, March 15.—"Freezing" of prices at the outbreak of war and a tax of 95 per cent on excess profits to eliminate profiteering in times of war are proposed in a report by the War Policies Commission submitted to Congress by President Hoover.

SUMMARY OF THE WEEK'S BUSINESS

Delays in Ford Motor Co. Purchases Slow Up Steel Mill Schedules

Ingot Output Down to 25 Per Cent—Operations Lower in Several Districts—New Bar Prices for Michigan

NOT only has the Ford Motor Co. failed to fulfill its recent promises of large steel orders, but the delays in its production schedule have slowed up other automobile manufacturers to such an extent that steel mill schedules have been adversely affected. The recent mild expansion in the requirements of miscellaneous consumers has not been sufficient to offset the lack of important buying by major steel-consuming groups, with the result that ingot production has declined two points this week to 25 per cent for the country as a whole.

Ford orders were placed this week for steel for 20,000 to 30,000 cars, but this represents only a small part of the contemplated production schedule for the near future. Assemblies this week are reported to be 100 cars a day, which will be increased to 200 a day next week and to a considerably larger number beginning March 28.

A slight expansion is occurring in the calls for steel from the railroads and for building construction, but the aggregate of such tonnage is having no appreciable effect on mill order books or steel output. Railroad purchases include 8000 tons of track accessories taken by the Erie and 6000 tons by the Nickel Plate, but rail buying, except for a few small orders, is still delayed by some of the roads that were expected to come into the market.

PRICE stabilization in steel products, however, is making progress. Some mills have stated that quotations made on specific projects which are not acted upon by March 21 will be withdrawn. Contract customers will have the privilege of specifying against first quarter commitments until the end of this month, but shipments must be accepted in April.

The movement to increase prices on some products is gaining adherents. Reinforcing bars will be advanced \$2 a ton along with merchant bars, with the possibility that Pittsburgh and Buffalo will take the same price. One or two Eastern plate mills have named 1.70c., Coatesville, as the second quarter price for their product. Hot-rolled strip makers have clarified their recent announcements by stating that minimum prices of 1.40c., Pittsburgh, for wide material and 1.50c. for narrow will be granted only to the largest buyers, and that all others will be charged \$2 a ton more. Cold-rolled strip mills are now quite generally quoting 2c., Pittsburgh or Cleveland, an advance of \$2 to \$3 a ton.

An important change in the method of quoting steel bars in the Michigan automobile district is to be put into effect for second quarter. Instead of a De-

troit base, as was at one time proposed, the mills will quote \$4 a ton above the Pittsburgh base for delivery to Detroit and \$5 a ton higher for delivery to Michigan cities outside of Detroit. On the basis of the price announced for second quarter, 1.60c., Pittsburgh, the Detroit delivered price will be 1.80c. a lb. and that to other Michigan cities will be 1.85c. This change is to be made as a compromise between the all-rail delivered prices and those available by water. The rail rate from Pittsburgh to Detroit is $28\frac{1}{2}$ c. per 100 lb., which, on the basis of 1.60c., Pittsburgh, makes the delivered price $1.88\frac{1}{2}$ c. a lb. Water deliveries were made last fall at 1.70c. to 1.75c. a lb. It is quite possible that the new arrangement will ultimately be applied to strip steel.

ALTHOUGH steel prices appear to be approaching stability, weakness continues in pig iron and scrap. A reduction of 50c. a ton has been made by Cleveland furnaces for foundry and malleable pig iron for local delivery, a situation that has been brought about by sharp competition between districts, Valley furnaces having attempted to sell in Cleveland, while Lake furnaces have invaded the Valley district. In the East, the competition of Dutch and Indian iron is having a depressing effect on the price situation, although no open breaks in quotations have occurred.

Heavy steel scrap is unchanged in price, but numerous other grades have declined at Pittsburgh, Chicago and in eastern Pennsylvania. Steel grades are firmer at Chicago, despite weakness in other sections of the market.

STEEL plant operations this week have declined at Pittsburgh, Wheeling, Cleveland and in the Valleys. Chicago shows a slight improvement, while the eastern Pennsylvania, Buffalo and Birmingham districts are barely holding at last week's rates. Sheet mill schedules are off to less than 25 per cent of capacity, largely because of the lack of automobile buying. Bar mills are also operating at lower rates, and tin plate production is down.

The failure of steel business to gain momentum at a time of year when the trend is usually upward is reflected in another decline in the unfilled tonnage of the United States Steel Corp., the eleventh in succession, bringing the total as of Feb. 29 to 2,545,629 tons, a drop of 102,521 tons, and the lowest amount of unshipped business reported by the Steel Corporation since it began making its monthly figures public.

THE IRON AGE composite prices are unchanged at 2.044c. a lb. for finished steel, \$14.48 a gross ton for pig iron and \$8.25 a ton for steel scrap.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, one Month and One Year Previous,
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Mar. 15, 1932	Mar. 8, 1932	Feb. 16, 1932	Mar. 17, 1932
Per Gross Ton:				
No. 2 fdy., Philadelphia.....	\$15.64	\$15.64	\$15.64	\$17.76
No. 2, Val'ey furnace.....	15.00	15.00	15.00	16.50
No. 2 Southern, Cincinnati.....	13.82	13.82	13.82	14.19
No. 2, Birmingham.....	11.00	11.00	11.00	12.00
No. 2 foundry, Chicago*.....	16.50	16.50	16.50	17.50
Basic, del'd eastern Pa.....	16.00	16.00	16.25	17.25
Basic, Valley furnace.....	14.50	14.50	14.50	16.50
Valley Bessemer, del'd P'gh.....	17.39	17.39	17.39	18.76
Malleable, Chicago*.....	16.50	16.50	16.50	17.50
Malleable, Valley.....	15.50	15.50	15.50	17.00
L. S. charcoal, Chicago.....	23.17	23.17	23.17	27.04
Perromanganese, sea'b'd car- lots.....	75.00	75.00	75.00	80.00

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

†Ferromanganese quotations adjusted to carload unit; larger quantities at discount.

Rails, Billets, etc.,

	Per Gross Ton:			
Rails, heavy, at mill.....	\$43.00	\$43.00	\$43.00	\$43.00
Light rails at mill.....	34.00	34.00	34.00	36.00
Rerolling billets, Pittsburgh.....	27.00	27.00	27.00	30.00
Sheet bars, Pittsburgh.....	26.00	26.00	26.00	30.00
Slabs, Pittsburgh.....	27.00	27.00	27.00	30.00
Forging billets, Pittsburgh.....	33.00	33.00	33.00	36.00
Wire rods, Pittsburgh.....	37.00	37.00	37.00	35.00
Skelp, grvd, steel, P'gh, lb.....	1.50	1.50	1.50	1.60

Finished Steel

	Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh.....		1.50	1.50	1.50	1.65
Bars, Chicago.....		1.70	1.70	1.60	1.70
Bars, Cleveland.....		1.65	1.65	1.55	1.70
Bars, New York.....		1.85	1.85	1.85	1.98
Tank plates, Pittsburgh.....		1.50	1.50	1.50	1.65
Tank plates, Chicago.....		1.70	1.70	1.60	1.70
Tank plates, New York.....		1.798	1.798	1.798	1.93
Structural shapes, Pittsburgh.....		1.50	1.50	1.50	1.65
Structural shapes, Chicago.....		1.70	1.70	1.60	1.70
Structural shapes, New York.....		1.76775	1.76775	1.76775	1.9032
Cold-finished bars, Pittsburgh.....		2.00	2.00	2.00	2.10
Hot-rolled strips, Pittsburgh.....		1.40	1.40	1.40	1.55
Cold-rolled strips, Pittsburgh.....		2.00	1.90	1.90	2.25

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Finished Steel

	Per Lb. to Large Buyers:	Mar. 15, 1932	Mar. 8, 1932	Feb. 16, 1932	Mar. 17, 1932
Hot-rolled annealed sheets, No. 24, Pittsburgh.....		2.20	2.20	2.15	2.35
Hot-rolled annealed sheets, No. 24, Chicago dist. mill.....		2.30	2.30	2.30	2.45
Sheets, galv., No. 24, P'gh.....		2.85	2.85	2.75	2.90
Sheets, galv., No. 24, Chicago dist. mill.....		2.95	2.95	2.85	3.00
Hot-rolled sheets, No. 10, P'gh.....		1.55	1.55	1.60	...
Hot-rolled sheets, No. 10, Chicago dist. mill.....		1.65	1.65	1.70	...
Wire nails, Pittsburgh.....		1.95	1.95	1.95	1.90
Wire nails, Chicago dist. mill.....		2.00	2.00	2.00	1.95
Plain wire, Pittsburgh.....		2.20	2.20	2.20	2.20
Plain wire, Chicago dist. mill.....		2.25	2.25	2.25	2.25
Barbed wire, galv., Pittsburgh.....		2.60	2.60	2.60	2.55
Barbed wire, galv., Chicago dist. mill.....		2.65	2.65	2.65	2.60
Tin plate, 100-lb. box, P'gh.....		\$4.75	\$4.75	\$4.75	\$5.00

Old Material

	Per Gross Ton:				
Heavy melting steel, P'gh.....	\$10.25	\$10.25	\$10.25	\$12.75	
Heavy melting steel, Phila.....	7.37 1/2	7.37 1/2	7.37 1/2	10.50	
Heavy melting steel, Chicago.....	7.12 1/2	7.12 1/2	7.12 1/2	10.00	
Carwheels, Chicago.....	7.00	7.25	7.50	10.50	
Carwheels, Philadelphia.....	9.50	10.50	10.50	13.50	
No. 1 cast, Pittsburgh.....	9.50	9.75	9.75	12.50	
No. 1 cast, Philadelphia.....	10.00	10.00	10.00	11.50	
No. 1 cast, Ch'go (net ton).....	7.00	7.50	7.50	9.50	
No. 1 RR. wrot., Phila.....	8.50	8.50	8.50	12.00	
No. 1 RR. wrot., Ch'go (net).....	7.50	6.50	6.50	8.00	

Coke, Connellsville,

	Per Net Ton at Oven:			
Furnace coke, prompt.....	\$2.25	\$2.25	\$2.25	\$2.50
Foundry coke, prompt.....	3.50	3.50	3.50	3.50

Metals,

	Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York.....		6.42 1/2	6.50	6.62 1/2	10.12 1/2
Electrolytic copper, refinery.....		5.75	6.25	6.00	9.75
Tin (Straits), New York.....		21.65	22.10	22.15	27.50
Zinc, East St. Louis.....		2.80	2.80	2.82 1/2	4.00
Zinc, New York.....		3.17	3.17	3.19 1/2	4.35
Lead, St. Louis.....		3.00	3.05	3.55	4.25
Lead, New York.....		3.15	3.30	3.75	4.50
Antimony (Asiatic), N. Y.....		6.20	6.25	6.50	7.25

▲▲▲ The Iron Age Composite Prices ▲▲▲

Finished Steel

March 15, 1932	2.044c. a Lb.	\$14.48 a Gross Ton
One week ago	2.044c.	14.48
One month ago	2.037c.	14.48
One year ago	2.142c.	15.71

Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.

Pig Iron

2.044c. a Lb.	\$14.48 a Gross Ton
2.044c.	14.48
2.037c.	14.48
2.142c.	15.71

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Steel Scrap

\$8.25 a Gross Ton
8.25
8.25
11.08

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	High	Low		
1932	2.044c., March 8; 2.037c., Jan. 19	\$14.81, Jan. 5; 14.48, Feb. 9	\$8.50, Jan. 12; 8.25, Feb. 9	
1931	2.142c., Jan. 13; 2.052c., Dec. 29	15.90, Jan. 6; 14.79, Dec. 15	11.33, Jan. 6; 8.50, Dec. 29	
1930	2.362c., Jan. 7; 2.121c., Dec. 9	18.21, Jan. 7; 15.90, Dec. 16	15.00, Feb. 18; 11.25, Dec. 9	
1929	2.412c., April 2; 2.362c., Oct. 29	18.71, May 14; 18.21, Dec. 17	17.58, Jan. 29; 14.08, Dec. 3	
1928	2.391c., Dec. 11; 2.314c., Jan. 3	18.59, Nov. 27; 17.04, July 24	16.50, Dec. 31; 13.08, July 2	
1927	2.453c., Jan. 4; 2.293c., Oct. 25	19.71, Jan. 4; 17.54, Nov. 1	15.25, Jan. 11; 13.08, Nov. 22	
1926	2.453c., Jan. 5; 2.403c., May 18	21.54, Jan. 5; 19.46, July 13	17.25, Jan. 5; 14.00, June 1	
1925	2.560c., Jan. 6; 2.396c., Aug. 18	22.50, Jan. 13; 18.96, July 7	20.83, Jan. 13; 15.08, May 5	

	High	Low		
1932	\$8.25, Feb. 9	8.25		
1931	8.25	8.25		
1930	11.25, Dec. 9	11.25		
1929	14.08, Dec. 3	14.08		
1928	13.08, July 2	13.08		
1927	13.08, Nov. 22	13.08		
1926	14.00, June 1	14.00		
1925	15.08, May 5	15.08		</

Steel Output Declines at Pittsburgh, Wheeling and in the Valleys

PITTSBURGH, March 15.—The first half of March has failed to bring material improvement to the local steel industry, and production has declined as a result of the failure of releases to show definite gains. With the major consuming lines practically dormant, miscellaneous demand, which has shown improvement this month, has been unable to offset successive decreases in automotive consumption. With the exception of orders for forgings and tool steel, purchases by the Ford Motor Co. in the Pittsburgh and Valley districts have been negligible, and releases from other Detroit companies continue to fall off.

Structural steel inquiry is heavier and prospective reinforcing bar tonnage has increased. However, actual orders are light, and many mills are unable to ship against backlog tonnage on their books. Purchases by the railroads are still scattered and light, the only important orders of the week having been for track accessories for the Erie and Nickel Plate.

Steel ingot production in the Pittsburgh district has declined rather sharply to 22 per cent of capacity, with several independent open-hearth plants entirely inactive. Production of the larger interests has either declined or barely held its own. Raw steel output in the Valleys has also declined to 27 per cent, even though a steel works blast furnace has resumed production. In the Wheeling district, ingot production has declined to about 30 per cent, the lowest rate since the beginning of the year. Sheet schedules this week are off sharply to less than 25 per cent of capacity, and tin plate production is down. Even though this set-back is considered temporary, seasonal gains in tin plate consumption are overdue. Bar mills are engaged at a lower rate, while output of the other principal finished steel products shows little change.

Continued efforts toward price stabilization are offering the market its most favorable aspect. Quotations on the common finishes of sheets have been fairly well established, and cold-rolled strip is better maintained. On bars, plates and shapes, the 1.60c., Pittsburgh, asking price has had little test, but is being generally quoted by the leading producers. Quotations on hot-rolled strip have been clarified by the establishment of a \$2 range between large contract purchases for

Steel ingot production has declined at Pittsburgh, Wheeling and in the Valleys.

* * *

Failure of Ford Motor Co. to place expected large orders has slowed up automotive buying generally.

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Slight improvement in miscellaneous demands this month not sufficient to overcome inertia in major lines.

* * *

Price stabilization movement grows despite absence of increasing demands.

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second quarter and small-lot sales. Wire products seem to be holding particularly well. The pig iron market is quiet. Some grades of scrap are weaker in the face of further hold-ups at consuming points and the failure of large buyers to come into the market.

Pig Iron

The month to date has brought no change to the pig iron market, which is featured by a lack of forward buying and exceptionally restricted foundry melt. Buying is mostly in the form of carload lots, and prices are nominally unchanged.

Semi-Finished Steel

Shipments this month have shown no improvement over those of February, and are lower with some companies. Prices are unchanged, with some sellers quoting \$27, Pittsburgh, for billets, slabs and sheet bars, although recent sales have brought only \$26. Wire rods are better maintained at \$37, Pittsburgh or Cleveland, and second quarter business is being solicited at this figure.

Rails and Track Supplies

Pittsburgh producers shared in the track accessory business placed last week by the Erie and the Nickel Plate Railroads. No other tonnage of importance has been booked, and the predicted rail inquiry of the New York Central has not yet appeared. Mills are running one or two days a week.

Bars, Plates and Shapes

New inquiry for reinforcing bars and structural steel is coming out in fair volume, but current awards are still rather light. A lock and dam in the Ohio River below Pittsburgh, on which bids will be taken April 10, requires 1700 tons of shapes and plates. Some small reinforcing bar inquiries have also appeared in the district, and the volume of new work coming out is definitely expanding. However, mills and fabricating shops are not very busy, the principal activity being in old orders which have just reached the specification stage. No increase in tonnage is reported from the automobile industry, but miscellaneous consumers of bars are accounting for a fair amount of business.

The price structure is showing more stability, and a few orders are reported at 1.60c., Pittsburgh, for bars and plates. However, some large consumers are being covered for the second quarter at the old price of 1.50c., and some business is being attracted to makers' books by this increase. Under the new schedules reinforcing bars are quoted at 1.50c., Pittsburgh or Buffalo, to distributors.

Cold-Finished Steel Bars

While the rate of specifications has shown no improvement this month, sentiment is somewhat better and the volume of inquiry seems to have improved. The price is fairly well held at 2c., Pittsburgh, and some buyers have already extended their commitments into the second quarter at this figure.

Tubular Goods

Pipe business shows little change, although increased demand for standard pipe has been in evidence since the first of the month. Oil country goods are very dull, but there is some activity in mechanical tubing as well as in boiler tubes. No definite inquiry for line pipe has appeared, but one or two of the projects pending may become active before the end of the month. Pipe mill operations are still not above 20 per cent and very intermittent. Warehouse stocks are low, and mills are in no hurry about increasing them at this time.

Wire Products

Tonnage this month is still running somewhat ahead of that of February, but is showing little increase so far as

jobber demand is concerned. Fencing is still quiet, and other merchant products are almost as dull. Some second quarter business has been booked. Prices of 2.20c. a lb., Pittsburgh, on manufacturers' wire, and \$1.95 a keg on nails are well maintained.

Sheets

Although the volume of current tonnage is still rather disappointing, satisfactory progress is being made toward price stabilization. The quotations named about a month ago as the minimum for second quarter purchases are now fairly well established, even though contract tonnage is still being shipped at lower figures. No Ford orders have been reported in this district, and buying by the other automobile companies is at a minimum. As a result, production has slipped off rather sharply this month, and is not averaging more than 25 per cent of capacity. Some electrical sheet tonnage is being booked, and refrigerator stock is still one of the brightest spots in the market. Miscellaneous demand is just about holding its own.

Tin Plate

Seasonal increase in specifications has failed to make its appearance, but sentiment in the trade is still rather favorable. Tonnage specified in March is ordinarily shipped out during April, and sometimes reaches the consumer for the early May canning season. As yet scarcely any such business is reaching mills. Operations are lower, being estimated at only about 40 per cent of capacity.

Strip Steel

Prices on hot-rolled strip have now been clarified, with 1.40c. and 1.50c., Pittsburgh, being quoted on large volume contract accounts, and 1.50c. and 1.60c. on less carloads and other small spot orders. All these prices represent an increase over recent quotations, as large buyers have been able to beat 1.40c. and 1.50c., while even the smallest users were occasionally able to secure such figures. Stabilization on cold-rolled material is progressing, as the 2c. price is to be applicable to all accounts. Some business has been placed at this figure, and it seems to be the only price outstanding at this time. The volume of strip orders this month is barely holding its own, and has fallen under that of February with some makers. This decrease is principally attributed to the automobile industry, while some other lines are slightly more active.

Coke and Coal

Heating coke has been considerably more active in the last week, but the foundry and furnace grades are still very dull. The price on furnace coke is weak, but no change has been made in the quotable market, which remains at \$2.25, Connellsville. Demand for

domestic coal is heavier, but industrial and railroad fuel are still very quiet.

Old Material

Although the market on the principal grades is quoted unchanged, a weaker tone has developed in the face of reduced ingot output and hold-ups at important consuming points. No significant buying of heavy melting steel or hydraulic compressed

sheets has been reported, and small transactions in other grades have brought out lower prices. Machine shop turnings have lost their recent strength, and specialties are weaker. Some of the principal consuming points are still taking shipments of heavy melting steel and hydraulic bundles, and the market is generally free from distress material in these grades. Expected purchases by one important user have been postponed for another week.

Eastern Pennsylvania Mills to Advance Plates \$2 a Ton

Price Stabilization Movement Gaining Adherents Despite Lack of Business Improvement

PHILADELPHIA, March 15.—The market in this district is even quieter than one week ago. Operations have let down slightly and are now estimated at 16 per cent of capacity. The better feeling which set in recently still prevails, but has not resulted in business improvement. There possibly is a moderately better tone in the market for plates, shapes and bars, but it is so mild as to carry no important stimulus. The sheet market also continues to lag, and is spotty.

The trade is awaiting action of the Interstate Commerce Commission regarding the application by the Pennsylvania Railroad to the Reconstruction Finance Corporation for a loan of \$55,000,000. The railroad proposes an expenditure of \$68,000,000 on its New York-Washington electrification project and on improvements. The scrap market has weakened further.

Pig Iron

Except for scattered carlots, no new business is moving in pig iron. Melters are buying strictly for immediate needs. Their attitude seems to be one of waiting for business and not so much of seeking lower prices. While there are reports of disturbance in the market on account of stray tonnages of foreign iron unloaded near this district, they are having only a minor effect.

Plates, Shapes and Bars

Miscellaneous buying has been slightly freer, but the market continues to drag. Reports are current that formal announcement of an advance to 1.60c., Pittsburgh, may be made this week. This would raise the Coatesville quotation on plates to 1.70c. The prices are proposed to become effective on second quarter business. The New York Shipbuilding Co. has ordered steel, estimated

at 350 tons, for repair work on four Scantic line boats. The increased steamship rates of 32½c. and 35c. per 100 lb. on shipments to the Pacific Coast from Atlantic ports, which went into effect March 1, caused the movement of some tonnage before they became operative, but very little since then. The lower rate applies to Class B and the higher rate to Class A boats. The rate was formerly 20c. for both classes. The plan of the Pennsylvania Railroad to expend \$68,000,000 on electrification and other improvements between New York and Washington has created a great deal of interest. The road has asked the Reconstruction Finance Corporation for a loan of \$55,000,000. It is reported that, should the Interstate Commerce Commission approve the loan, a matter of doubt in some quarters, the road would be required to suspend paying dividends. It has continuously paid dividends since 1847.

Sheets

The market is quiet. Some makers report a slight improvement in miscellaneous orders, but large buyers, notably automobile and automobile body builders, are still almost entirely out of the market. There still is some shading of prices, though levels appear to be approaching stabilization. This may be due to the fact that mills appear to be making a strong effort to put higher prices into effect April 1.

Exports

Imports last week were: Chrome ore from British India, 510 tons; pig iron from British India, 348 tons; galvanized steel strips from England, 7 tons; hoop steel from England, 20 tons.

Old Material

The market is inactive and a number of grades have dropped 50c. Mills continue to hold up releases.

Chicago Steel Trade Slightly Better; Nearby Outlook Not Clear

CHICAGO, March 15.—Although tendencies are still somewhat mixed as to ingot production, a slight increase is indicated, bringing the average for the district close to 24 per cent of capacity. Bar mill products, sheets and rails account for the gain. The outlook for the immediate future has not cleared.

Building construction in the Chicago area is on a slow upgrade. Fabricators find small jobs more numerous. It is disclosed that architects are fairly well fortified with work that is approved but will not be released until general business conditions improve. Better weather conditions are bringing road building programs a step nearer. A general 20 per cent reduction in building mechanics' wages, effective March 11, is looked upon as a favorable readjustment. More suppliers of miscellaneous railroad equipment are receiving orders and they are encouraged over the outlook. This situation is now perceptible among foundries that are finding some grades of scrap, such as brake shoes, very scarce, with prices leaning to the strong side. The addition of a number of active open-hearth furnaces is resulting in larger releases of heavy melting steel, on which dealers' profits have narrowed measurably in recent weeks.

The disposition to stiffen prices seems deeper rooted than at any time this year. New buying of all commodities remains at close range even under the threat of a sales tax. Local sellers are little concerned over this proposed tax measure beyond consideration of insertion in contracts of a protective clause which will pass the tax, if imposed, upon the consumer.

Pig Iron

March shipments of Northern iron are holding recent gains, but the rate of growth seems to be retarded except to foundries that supply miscellaneous equipment to railroads. Prices at \$16.50, base, a gross ton, local furnaces, have less of the nominal aspect, especially on small tonnages. Consumer interest is somewhat keener, as evidenced by a moderate growth in inquiries. Charcoal iron and Southern iron are steady in a quiet market.

Bolts, Nuts and Rivets

Sellers are out with second quarter contracts, but it is too early to draw

Steel business improves moderately, principally in bars, sheets and rails.

* * *

Building construction in Chicago area on the upgrade.

* * *

Road building programs will release tonnages of bars and mesh soon.

* * *

Some grades of old material scarce.

* * *

conclusions as to their reception. Specifications remain sluggish, and spot sales are light. New discounts appear to be taking hold.

Rails and Track Supplies

Specifications for rails and track supplies are sufficiently large to bring total specifications to the highest point so far this year. The aggregate is not large, as gaged by previous late winter periods, but is sufficient in size to afford intermittent operation of local rail mills. The Nickel Plate has ordered 6000 tons of fastenings and the Erie has placed 8000 tons, parts of both tonnages having been awarded to Chicago producers. The Milwaukee Road is starting a plan to order out 2000 tons of rails and 1000 tons of fastenings each month. Its present program calls for 16,000 tons of rails. Carryover tonnages from 1931, while not as heavy as a year ago, would be a distinct contribution to the present market if releases could be obtained.

Plates

The outlook in this market is as dull as at any time so far this year. There is still no word from railroads as to contemplated car building programs, though here and there a few underframes are being considered. The unstabilized condition of the oil industry is working against expansion and betterment programs, and it is still too early in the northern part of the country for active work in laying oil and gas lines. A dam at Alma, Wis., will take a plate tonnage, and 250 tons will be used for tanks awarded to a fabricator in the South-

west. A utility company operating in Iowa is taking prices on two miles of 16-in. and five miles of 12-in. pipe. Although men have been called back to work in many railroad shops, only very small quantities of materials are being ordered from mills.

Structural Material

After an upward swing for several weeks, the structural steel market has again turned quiet, and not a great deal of new business is coming to hand to assure better mill and shop schedules in the near future. Architects' and engineers' offices are all but closed, though several of them have plans well advanced for projects that will go ahead as soon as general business improves. In fact, one Chicago office has more business signed up, but temporarily held in abeyance, than at any time in its history. Very small quantities of plain materials are in fabricators' yards, and the trend is to cut these to still smaller limits.

Sheets

Consumption continues to grow slowly, and hot mill operations are slightly more stable, though still uncertain. Current orders are all for prompt shipment.

Cast Iron Pipe

The trade is considerably encouraged by the turn of events both in the bond market and the interest that is growing among consumers of cast iron pipe. It seems certain that the bond market is slowly improving, and as it gains headway a number of projects will be released. Small tonnages are more in evidence, and a number of large projects are taking shape. Chief among these is seven miles of 12 and 16-in. pipe for a public utility company in Iowa. This job is being figured for steel pipe or cast iron pipe.

Bars

Specifications for bar mill products are steady, but there is little indication of impending increase in consumption. Agricultural implement manufacturers have all but completed late winter production schedules, and it seems quite probable that the industry will remain quiet until it starts its fall schedules. Some help is still expected from automobile manufacturers, but the situation so far is well

illustrated by the condition at local forge shops, which are working at about 10 per cent of capacity.

Wire Products

Slowly increasing use of wire products is still in evidence, the gain so far in March being about 5 per cent over the February rate. Nails are moving slightly faster, but field fencing is unusually dull for this time of year. Probably the most favorable outlook is in concrete reinforcement mesh, which promises to start moving soon in large quantities to spring road and pavement projects. Output of wire products is about 30 per cent of capacity.

Old Material

This market is enlivened by heavier releases of heavy melting steel and sizable consumer purchases of malleable and cast grades. One thousand tons of railroad cast was taken at an advance of 25c., but 2500 tons of malleable was sold at a decline of 50c. a ton. An inquiry for 500 tons of steel angles has not been covered. This grade is scarce. On pending railroad lists are 1000 tons offered by the Milwaukee Road, 900 tons by the Chicago & Alton and 2000 tons by the Burlington.

Buffalo Pig Iron Sales Affected by Imports

BUFFALO, March 15.—Pig iron business is confined to carload lots. Eastern business of the Buffalo producers has been practically eliminated through the competition of the Dutch and Indian iron. Delivery of this iron in many instances is being made by truck from storage yards. Furnace operations are unchanged.

Steel

The Lackawanna plant of Bethlehem Steel is operating five open-hearths, with the possibility of an increase to six some time this week. Republic Steel, after operating four open-hearths until the early part of this week, closed down, with the probability of resumption of the same operation Friday of this week. Wickwire Spencer is operating one open-hearth. Seneca Iron & Steel Co. is running at about 25 per cent.

The State highway department will receive bids on the superstructure of the Troy-Menands bridge, expected to involve between 6000 and 8000 tons of structural steel.

Old Material

No change in the situation is apparent. Suspensions continue to hold and shipments have been reduced to a minimum. The week passed without any important transactions.

Price Stabilization Gains in Eastern Steel Markets

Sales of Sheets on New Quotations Are More Frequent in New York District—Other Products Firmer

NEW YORK, March 15.—In the absence of any marked change in the volume of demand for steel products, the movement toward stabilization of prices at higher levels for the second quarter is gaining headway. The steel companies are consolidating their positions; in other words, they are taking all of the steps necessary to convince their customers that existing prices either on contracts or for specific projects will not carry beyond this month. In some instances, mills have informed bidders on specific work that the quotations given to them will be withdrawn on March 21 if not accepted by that date.

Makers of hot-rolled strip have clarified their position with regard to second quarter prices by stating that the present quotations of 1.40c., Pittsburgh, for wide and 1.50c., for narrow material will be given only to very large buyers, while smaller buyers, including single carload purchasers, will be asked to pay \$2 a ton higher. Most of the cold-rolled strip mills are now firmly quoting a minimum of 2c., Pittsburgh or Cleveland, or 2.20c., Worcester, Mass.

Eastern plate mills are expected to follow the lead of Pittsburgh mills in quoting an advance for second quarter. One Eastern mill, in addition to Bethlehem, has named 1.70c., Coatesville, for second quarter.

Between now and the end of the month the steel companies will urge their contract customers to specify against their first quarter contracts for April shipment. Buyers are being informed that no specifications will be accepted beyond March 31 and deliveries must be taken before the end of April.

Pig Iron

The market is practically unchanged. Consumer interest is still limited to small quantities for quick delivery. A large buyer is understood to be negotiating for a round tonnage of high silicon iron, but no specific inquiry has been issued. Sales continue to be small, with last week's total at 2500 tons, compared with a like amount the week before and 2000 tons two weeks ago. Quotations on domestic brands are unchanged, while prices on foreign iron are somewhat weaker.

Reinforcing Bars

Local distributors have been advised by some bar mills that March 21 has been set as the date for withdrawal of all outstanding quotations. An advance of \$2 a ton to a basis of

1.60c., Pittsburgh, or 1.95c., New York, is expected to become generally effective after that date. New construction work is at a minimum, while awards of a number of pending projects are still held up because of financial difficulties.

Old Material

Shipments to Eastern mills are still held up. New business is confined to scattered car lots. Prices are nominal.

Canadian Business Makes Little Progress

TORONTO, March 14.—Business in the Canadian iron and steel markets has not yet reached a state of definite improvement, but leading interests state that new business is more prominent than it was at the beginning of the year. Mills which were almost entirely shut down a month or six weeks ago are running, though at a low rate. Unless further contracts are awarded, however, it is understood that operations will again cease at the mills at Sault Ste. Marie, Ont., and Sydney, N. S. No rail contracts have been awarded by the Canadian railroads, and until business of this nature develops there is little prospect of much activity in mill operations.

Pig Iron

Recent sales in this market have been somewhat ahead of those at the first of the year. Melters are entering the market at more frequent intervals, but continue to buy in single car lots for spot needs. No booking has been done for future delivery. The fact that the Massey-Harris Co. has taken on some 600 men is expected to bring buying into the pig iron market. In the past, implement makers purchased iron from United States producers, but with the discount on Canadian funds it is stated that iron can be procured cheaper from Canadian producers despite the fact that iron comes in free of duty for implement manufacture. Competition from foreign sellers is negligible, and local interests have the market in their own hands. Prices are firm and unchanged.

Old Material

Sales are holding at about the level of the past two or three weeks, with no buying for future delivery. Steel scrap is at a standstill. New business is largely in iron grades.

Cleveland Operations Lower; Motor Industry Orders Small

Slight Falling Off in Demand for All Steel Products—Ford Production Program Still in Abeyance

CLEVELAND, March 15.—The local steel market was very dull the past week, there being apparently a slight falling off in the demand for nearly all products. The market is getting little support at present from the motor car industry, as the tonnage that is coming from that source is quite limited. The Ford Motor Co. has issued some small releases to parts manufacturers, but producers have no definite knowledge as to when that company expects to purchase large tonnages of steel to put its plant on a production basis.

The Wheeling & Lake Erie Railroad has postponed taking bids for 50 to 100 gondola cars until March 21, and no other railroad business is in prospect in this territory.

Steel plant operations in Cleveland declined three points this week to 38 per cent of ingot capacity because of the closing down of one open-hearth furnace.

The cold weather has proved very helpful to steel plant and blast furnace interests in that it has created a very active demand for domestic by-product coke, large stocks of which had accumulated during the mild weather.

While there has been little test of the new steel prices, these are being maintained on products that have been advanced, and the firm stand that is being taken by the steel industry for better prices indicates that they will become generally effective for second quarter business. The hot-rolled strip price situation appears to have been definitely cleared up by the announcement of most producers that the present 1.40c. and 1.50c. prices will remain in effect for large buyers for the second quarter, but small consumers will be required to pay an advance of \$2 a ton. Pig iron in foundry and malleable grades has been reduced 50c. a ton in Cleveland for local delivery. This reduction evidently has been made to shut out outside iron, which, with the competitive situation that has existed for some time, has been offered for Cleveland delivery at lower prices than the recent local furnace delivered prices.

Pig Iron

A price reduction of 50c. a ton on foundry and malleable iron to \$15.50 for Cleveland delivery was made by local producers March 14. This follows a \$1 a ton reduction last December. Local prices are now lower than at any time since 1915. The reduction this week has resulted from the competitive situation that has existed for

some time and which appears to have become more acute. While \$15 is the regular quotation for outside shipment, this is being shaded 50c. a ton or more for shipment outside of this territory. A Valley interest recently has tried to take business in Cleveland. The reduction in the local prices is expected to keep outside iron out of this city. Sales are light and shipments are about the same as in February.

Bars, Plates and Shapes

Two structural jobs in northern Ohio, requiring 700 tons of steel, were placed during the week. Little new work is in prospect. Government work in Detroit will require 300 tons of sheet steel piling. Orders are few in number for all products and confined to small lots. Little bar business is coming from forge shops and other plants doing automotive work. New prices of 1.65c., Cleveland, for steel bars and 1.60c., Pittsburgh, for plates and shapes are holding on new business, although most consumers are under contract for the current quarter at \$2 a ton lower.

Semi-Finished Steel

Large billets have settled to \$26, Cleveland, or the same price as sheet bars and slabs. Specifications are not holding up to recent volume.

Bolts, Nuts and Rivets

Present prices of \$2.25 per 100 lb., Cleveland and Pittsburgh, and \$2.35, Chicago, for large rivets, and 70, 10 and 5 per cent off list for small rivets

have been reestablished for the second quarter. The demand continues slow.

Sheets

With very little business coming from the automotive industry, orders were exceedingly light the past week. However, the market has a firmer tone than recently and the new prices are apparently being maintained on new business, although they are not being given a test on round tonnages, as many consumers are covered by contracts. This is particularly true of auto body sheets, although on this grade producers appear determined to hold to the new 2.90c. price.

Strip Steel

Prices for hot-rolled strip appear to have become definitely established at 1.40c. for wide and 1.50c. for narrow for large buyers and 1.50c. and 1.60c. for small consumers. Producers seem to have taken a firm stand on the maintenance of the quantity differentials for the smaller trade, and a few second quarter contracts have been closed at the higher prices. Advances to 2c., Cleveland, on cold-rolled strip and to 3c. for fender stock are now being generally quoted. Strip orders are light.

Cold-Finished Steel Bars

Although the 2c., Cleveland, price has been named for the second quarter, this has not been tested and concessions to 1.90c. are being made for attractive orders. Demand is very light.

Old Material

With shipments generally cut off locally and to the Valley district, the market is virtually at a standstill. A local consumer has shut off shipments of blast furnace scrap, the only grade that it has been taking for some time. Machine shop turnings are being taken by a Valley district mill, and these have declined 25c. a ton locally. While other grades are untested, the market has a weak tone.

Reinforcing Steel

Awards 3500 Tons—New Projects 2200 Tons

AWARDS

Needham-Wellesley, Mass., 100 tons, two State bridges, to Concrete Steel Co.

Hot Springs, Ark., 950 tons, Army and Navy Hospital, to Laclede Steel Co.

St. Paul, 400 tons, school, to Laclede Steel Co.

Chicago, 200 tons, Monroe Street telephone exchange, to an unnamed bidder.

San Diego and Imperial Counties, Calif., 300 tons, State highway structures, to Soule Steel Co.

Sunnyvale, Calif., 500 tons, barracks and other structures at Navy dirigible base, to Pacific Coast Steel Co.

Fresno, Calif., 100 tons, State teachers college library, to Badt-Falk Co.

Port Angeles, Wash., 100 tons, Federal building, to Pacific Coast Steel Co.

Los Angeles County, Calif., 225 tons, highway structures near Calabasas, to Soule Steel Co.

Cle Elum, Wash., 350 tons, additional tonnage for reclamation project dam, to Sheffield Steel Co.

San Diego County, Calif., 100 tons, highway structures near Del Rey, to Pacific Coast Steel Co.

Los Angeles, 183 tons, grade separation at First and Glendale Streets, to Blue Diamond Corp.

NEW REINFORCING BAR PROJECTS

Boston, 300 tons, boys' Latin school.

Pittsburgh, 200 tons, building for Veterans' Hospital at Aspinwall.

Pittsburgh, 200 tons, East Liberty Presbyterian Church.

Ludlow, Ky., 130 tons, city reservoir.

Jackson, Mich., 200 tons, post office.

Joliet, Ill., 100 tons, three bridges.

Waukesha, Wis., 400 tons, quarry grade separation; bids taken March 15.

Los Angeles, 100 tons, Upper Hollywood reservoir structures.

San Diego County, Calif., 230 tons, Chocolate Creek highway bridge; bids close March 30.

Arcata, Calif., 200 tons, building for State teachers college; bids close March 15.

Birmingham Steel and Pig Iron Business Still of a Routine Character; Outlook Unimproved

BIRMINGHAM, March 15.—The dismal outlook of the pig iron market is unchanged. Current bookings and shipments are behind those for the same period in both January and February. Contract tonnage is infrequent. Most of the present business is now being handled on a spot basis, with orders for small amounts. Quotations are being maintained on a base of \$11 for local deliveries. Operations have remained at the low point of five furnaces since the beginning of the month.

Steel

New tonnage is of a routine nature and not particularly active. The aggregate is close to the level of the past several weeks, omitting railroad tonnage. Sheet specifications have increased lately, as firmer prices will prevail on tonnage bought for next

quarter. Structural steel fabricators have increased their orders during the past two weeks. One company booked more business than during all of January and February. The largest order of the week was for approximately 1000 tons to be used in the new Montgomery, Ala., Post Office, and was placed with Virginia Bridge & Iron Co. Open-hearth operations have been the same since the first of the month, the Tennessee company operating four at Fairfield and Gulf States Steel two at Alabama City.

Old Material

With steel mill, blast furnace and foundry schedules at a very low point, the demand for old material has been almost negligible. Some business was placed for March, but shipments against such contracts have been small. Prices are unchanged.

structural shapes, following the recent advance, but the trade has expressed no complaint against the upward movement. The plate market is quiet, the oil industry failing to show an expected revival. Generally, the feeling is better.

Warehouse business is quiet. The recent advance in mill prices of plates, shapes and bars will not be followed by higher warehouse prices. These interests have been quoting on a basis of 1.70c., Chicago.

The Laclede Steel Co. has been awarded 950 tons of reinforcing bars for the Army and Navy Hospital at Hot Springs, Ark. All sizable local building projects are being held up pending a downward readjustment of building trades wages by April 1.

Old Material

An East Side mill is expected to come into the market within the next week or 10 days for a sizable tonnage of heavy melting steel, and another mill may make substantial purchases by the end of the month. Virtually nothing was done the past week. Railroad lists are small and yards are making no effort to sell at present prices, which are nominally unchanged.

Railroad lists: Chesapeake & Ohio, 5577 tons; Southern Pacific, 2420 tons; Alton, 750 tons; St. Louis-Southern, 14 carloads; Pullman Co. (St. Louis), 8 carloads.

Pacific Coast Steel Lettings for Construction Work Gain as Price Situation Becomes Firmer

SAN FRANCISCO, March 14.—Warehouse price schedules at San Francisco, Los Angeles and Seattle have been advanced to conform to the firmer mill prices and higher inter-coastal ocean freight rates. The effect has been some stimulation of small-lot business, which has been extremely sluggish since the first of the year. The market's price tone is noticeably stronger. Steel volume has been increased by the placing of a number of major contracts during the past 29 days. Reinforcing bars continue weak, though business is in fair volume. About 2000 tons was placed during the past week, and 700 tons is called for in new inquiries.

The Southern Pacific Co. placed 13,800 tons of 110 and 130-lb. rails for its 1932 requirements with the Colorado Fuel & Iron Co. No statement has been made as to any additional tonnage. It is understood that the road will place 500 tons of combination tie plates, although formal call for bids has not been issued.

Los Angeles plans a \$34,400,000 bond election about May 3 for the construction of municipal power system improvements, including \$17,500,000 for a 300-mile transmission line from Hoover Dam and \$11,240,000 for a steam generating plant at Wilmington. Seattle voted a \$600,000 bond issue on March 8 for over a mile of reinforced concrete seawall and sheet piling bulkhead. The project will cost \$1,200,000. Bids will be opened March 22 at Washington for a group of brick, reinforced concrete and steel frame buildings for a new veterans' home at Roseburg, Ore.; \$1,200,000 is

the estimated cost. A \$300,000 bridge will be constructed across the San Joaquin River at Stockton by the Santa Fe, Southern Pacific and Western Pacific Railways in connection with the city's belt line and classification yard project. The Army housing bill now pending in Congress provides for \$1,272,000 to be spent in Arizona and California.

In the past week 4500 tons of steel was placed for major projects, with 3500 tons involved in new inquiries. Cast iron pipe awards totaled 1100 tons, with 1850 tons in new inquiries.

St. Louis District Is Still Marking Time

ST. LOUIS, March 15.—Shipments of pig iron against contracts are maintained at an even rate, but new business is negligible. Steel mills in the district are still waiting for orders directly or indirectly from the Ford Motor Co. before buying more pig iron. Agricultural implement industries are doing very little; the same is true of the stove interests. Jobbing foundries report that business is picking up a bit. Prices are unchanged.

Steel

An additional open-hearth furnace in the district is expected to be put on this week, increasing the total operations to about 18 per cent of capacity.

The lack of actual tonnage offered has made it impossible to show a fair test of the strength of the market on

New England Pig Iron Business Unimproved

BOSTON, March 15.—No improvement is seen in pig iron business. Activity among New England foundries is still very low. Pig iron sales the past week were less than 1000 tons. A car of Royal Dutch iron has been sold to a Providence, R. I., foundry at \$16.50 a ton, delivered in yard. A Worcester, Mass., machinery maker this week will close on 300 tons of special analysis iron, delivery to extend over the next two or three months. Otherwise, there is no business in sight. Prices continue unsettled.

Old Material

Business is still in the doldrums and consists of an occasional car of heavy melting steel for Youngstown or Worcester, Mass., delivery, scattered small tonnages of No. 2 steel for Pennsylvania consumption, one or two cars of bundled skeleton for Worcester delivery and truck lots of textile and No. 1 machinery cast taken from nearby yards for New England foundries. Prices remain as they have been for more than a month.

National Steel Corp., Pittsburgh, has reported final net earnings of \$4,443,324, equivalent to \$2.06 a share on the common stock outstanding. Earned surplus as of Dec. 31, 1931, amounted to \$4,865,734.

Fabricated Structural Steel

Lettings and New Projects in Larger Volume— Awards of 15,750 Tons

BOOKINGS of fabricated structural steel the past week were almost double those in the previous week, totaling 15,750 tons. The largest awards include 8000 tons for a publishing building in Los Angeles and 1000 tons for a post office in Montgomery, Ala. There was little activity in the East. New inquiries of 15,000 tons compare with 9900 tons a week ago. The Troy-Menands highway bridge in New York will require between 6000 and 8000 tons, a lock and dam on the Ohio River 1700 tons, and a post office in Omaha, Neb., 1000 tons. Awards follow:

NORTH ATLANTIC STATES

Boston, 150 tons, police station on Richmond Street, to Boston Structural Steel Co.
Boston, 102 tons, Berkeley Street police station, to Palmer Steel Co.
New York, 300 tons, addition to Bankers Trust Co., to American Bridge Co.
Safe Harbor, Pa., 150 tons, take-off structure, to Belmont Iron Works.
State of Maryland, 195 tons highway bridge over Monocacy River, to Pittsburgh-Des Moines Steel Co.

SOUTH AND SOUTHWEST

Montgomery, Ala., 1000 tons, post office, to Virginia Bridge & Iron Co.
New Orleans, 120 tons, plant for Continental Can Co., to Southern Steel Works.
Chickasha, Okla., 250 tons, Chickasha Cotton Oil Co., to J. B. Klein Iron & Foundry Co.

CENTRAL STATES

Cincinnati, 290 tons, conveyor housings, to Dayton Structural Steel Co.
Niles, Ohio, 440 tons, South Main Street bridge, to American Bridge Co.
State of Illinois, 175 tons, highway bridges, Bureau County, to Midland Structural Steel Co.
State of Illinois, 290 tons, highway bridges in Fulton County, to Wisconsin Bridge & Iron Co. and Vincennes Bridge Co.
Rittman, Ohio, 275 tons, building for Ohio Salt Co., to Burger Iron Co.
Milwaukee, 100 tons, sluice gates for United States Engineer office, to Pittsburgh-Des Moines Steel Co.
Milwaukee, 525 tons, viaduct, to Milwaukee Bridge Co.
Duluth, Minn., 250 tons, Duluth Steam Corp., to St. Paul Foundry Co.
State of Nebraska, 430 tons, bridges, to Paxton-Vierling Iron Works, Omaha.
State of Illinois and Iowa, 150 tons, bridges, to Vierling Steel Works.

WESTERN STATES

Superior, Mont., 250 tons, bridge, to Minneapolis-Moline Power Implement Co.
Maywood, Cal., 350 tons, motor shop for Chrysler Motor Co., to Consolidated Steel Co.
Los Angeles, 8000 tons, publishing building, to Consolidated Steel Co.
Tacoma, Wash., 253 tons, County bridge over Pend d'Oreille River, to Illinois Steel Bridge Co., Joliet, Ill., previously reported to an unnamed bidder.
Los Alimos, Cal., 181 tons, State highway bridge, to the Pacific Coast Engineering Co.
San Francisco, 100 tons, pier shed No. 44, to McClinic Marshall Corp.
Palo Alto, Cal., 320 tons, stadium seats and additions at Stanford University, to Judson Pacific Co.
Salinas, Cal., 100 tons, State armory, to Palm Iron Works.
Klamath Falls, Ore., 417 tons, Great Northern Railway shop additions, 255 tons to Poole & McGonigle; 162 tons to Truscon Steel Co.

HAWAII

Honolulu, 800 tons, aircraft overhaul shop, to Belmont Iron Works.

Chicago, 1200 tons, general exhibit building for World's Fair.

Omaha, Neb., 1000 tons, post office.

WESTERN STATES

Riverside, Cal., 100 tons, tank and tower at March Field army air field, Pittsburgh-Des Moines Steel Co., low bidder.

Lewis County, Wash., 200 tons, Chehalis River highway span at Adna; bids close April 5.

Kittitas, Wash., 100 tons, tank and tower.

State of Washington, 650 tons, Snohomish River highway bridge.

Roseville, Cal., 500 to 1000 tons, bulkheads for Pacific Fruit Express.

San Francisco, 700 tons, alterations to main post office.

Merced, Cal., 100 tons, post office.

FABRICATED PLATE

AWARDS

Towson, Md., 230 tons, elevated water tank, to Chicago Bridge & Iron Co.

Los Angeles, 105 tons water tank for United States Government, to Pittsburgh-Des Moines Steel Co.

Zanesville, Ohio, 230 tons, water tank to Pittsburgh-Des Moines Steel Co.

NEW PROJECTS

Los Angeles, 250 tons, 2½ million gal. tank for city, Western Pipe & Steel Co., low bidder.

San Diego will open bids April 11 on 400 tons in connection with construction of El Capitan dam.

Pipe Lines

Walter K. Campbell, Wichita Falls, Tex., plans installation of 2-in. steel pipe line from Los Olmos oilfield, Starr County, to McAllen, Tex., about 12 miles, to handle about 1000 bbl. of oil daily.

Los Angeles, Cal., let contract to Consolidated Steel Co., Los Angeles, for steel penstock and appurtenances at \$32,000.

Montpelier, Idaho, has approved bond issue for water system, which will require 16,000 ft. of 12-in. main.

Los Angeles opened bids on 254 tons for one mile of 45-in. pipe line; Western Pipe & Steel Co., is low bidder.

Cincinnati Pig Iron Buying in Small Lots

CINCINNATI, March 15.—Small-lot purchases, totaling less than 1000 tons, constituted the pig iron business in this district the past week. Consumers are watching business trends carefully and are holding inventories to conservative levels. Shipments against contracts are without change, as the melt continues to be low. Inquiry is lacking, and current business is the result of definite sales effort. Southern furnaces continue to sustain prices on the present small volume, but uncertainty is noticeable in Northern quotations. The furnace of the Hamilton Iron & Coke Co. was blown in the past week.

Old Material

With new business at "bargain" prices and shipments light, the scrap market is without feature.

Prices of Finished and Semi-Finished Steel

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.50c. to 1.60c.
F.o.b. Chicago	1.70c.
Del'd Philadelphia	1.81c. to 1.91c.
Del'd New York	1.85c. to 1.95c.
F.o.b. Lackawanna	1.65c.
F.o.b. Birmingham	1.70c. to 1.75c.
C.i.f. Pacific ports	2.00c.
<i>Billet Steel Reinforcing</i>	
F.o.b. P'gh mills, 40, 50, 60-ft.	1.50c. to 1.60c.
F.o.b. Birmingham, mill lengths	1.75c.
F.o.b. Cleveland	1.50c. to 1.55c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.30c. to 1.35c.
F.o.b. Chicago Heights mills	1.50c. to 1.60c.
Del'd Philadelphia	1.49c. to 1.59c.

Iron

Common iron, f.o.b. Chicago	1.70c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.11c.
Common iron, del'd New York	2.15c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.50c. to 1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.70c. to 1.75c.
Del'd Cleveland	1.7035c. to 1.8035c.
Del'd Philadelphia	1.6935c. to 1.7435c.
F.o.b. Coatesville	1.60c. to 1.65c.
F.o.b. Sparrows Point	1.60c. to 1.70c.
F.o.b. Lackawanna	1.60c. to 1.70c.
Del'd New York	1.798c. to 1.898c.
C.i.f. Pacific ports	1.85c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.50c. to 1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.70c. to 1.75c.
F.o.b. Lackawanna	1.60c. to 1.70c.
F.o.b. Birmingham	1.70c. to 1.75c.
C.i.f. Pacific ports	2.00c.
<i>Billet Steel Reinforcing</i>	
F.o.b. P'gh mills, 40, 50, 60-ft.	1.50c. to 1.60c.
F.o.b. Birmingham, mill lengths	1.75c.
F.o.b. Cleveland	1.50c. to 1.55c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago mill	2.05c.
F.o.b. Buffalo	2.00c.

Alloy Steel Bars

(F.o.b. maker's mill)	Alloy Quantity Bar Base, 2.65c. per Lb.
S.A.E. Series	Alloy Differential per 100 Lb.
2000 (1 1/2% Nickel)	\$0.25
2100 (1 1/2% Nickel)	0.55
2300 (3 1/2% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70

4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	0.20
6100 Chromium Vanadium Bar	1.20
6100 Chromium Vanadium Spring Steel	0.95
9250 Silicon Manganese Spring Steel (flats)	0.25
Rounds and squares	0.50
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is $\frac{1}{2}$ c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a section area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than $2\frac{1}{4}$ in. thick, regardless of sectional area, take the bar price.

Cold-Finished Bars

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.00c.
Bars, f.o.b. Chicago	2.00c.
Bars, Cleveland	1.90c. to 2.00c.
Bars, Buffalo	2.00c.
Shafting, ground, f.o.b. mill	*2.35c. to 3.30c.

*According to size.

Sheets, Strip, Tin Plate, Terne Plate

Sheets

Hot-Rolled

	Base per Lb.
No. 10, f.o.b. Pittsburgh	1.55c.
No. 10, f.o.b. Chicago mill	1.65c.
No. 10, del'd Philadelphia	1.86c.
No. 10, f.o.b. Birmingham	1.70c.
No. 10, c.i.f. Pacific Coast ports	2.30c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.20c.
No. 24, f.o.b. Chicago mills	2.30c.
No. 24, del'd Philadelphia	2.46c. to 2.51c.
No. 24, f.o.b. Birmingham	2.35c. to 2.50c.
No. 24, c.i.f. Pacific Coast ports	2.80c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.25c.
No. 10 gage, f.o.b. Chicago mills	2.35c.
No. 10 gage, f.o.b. Philadelphia	2.46c.
No. 20 gage, f.o.b. Pittsburgh	2.75c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.75c.
No. 20 gage, f.o.b. Chicago mills	2.85c.
No. 20 gage, del'd Philadelphia	3.06c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	2.90c.
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Steel Furniture Sheets

No. 10, f.o.b. Pittsburgh	2.65c.
No. 20, f.o.b. Pittsburgh	3.15c.

(Prices on furniture stock include stretcher leveling but not resurfacing.)

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	2.85c.
No. 24, f.o.b. Chicago mills	2.95c.
No. 24, del'd Philadelphia	3.16c.
No. 24, f.o.b. Birmingham	3.00c.
No. 24, c.i.f. Pacific Coast ports	3.45c.

Long Terne

No. 24, unassorted, 8-lb. coating, f.o.b. P'gh	2.90c. to 3.00c.
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Vitreous Enameling Stock

No. 10, f.o.b. Pittsburgh	2.60c.
No. 20, f.o.b. Pittsburgh	3.10c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.40c. to 2.50c.
No. 28, Chicago mill	2.50c. to 2.60c.

Tin Plate

	Base per Box
Standard cokes, f.o.b. P'gh district mills	\$4.75
Standard cokes, f.o.b. Gary	4.85

STEEL PIPE AND TUBING

Supplementary discounts of 5 and $2\frac{1}{4}$ %, and on galvanized by $1\frac{1}{2}$ points with supplementary discounts of 5 and $2\frac{1}{4}$ %.

On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and $2\frac{1}{4}$ %.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is $2\frac{1}{4}$ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel	Charcoal Iron
2 in. and 2 1/4 in. 38	1 1/4 in. 1
2 1/4 in. 24 in. 46	1 1/4 in. 8
3 in. 52	2 in. 2 1/4 in. 13
3 1/4 in. 38 in. 54	2 1/4 in. 2 1/2 in. 16
4 in. 57	3 in. 17
4 1/2 in. to 6 in. 46	3 1/4 in. to 3 1/2 in. 18
6 in. 60	4 in. 20
7 in. 62	4 1/2 in. 21
8 in. 63	

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Bolts, Nuts, Coke, Coal, Fuel Oil, Cast Iron Pipe

WIRE PRODUCTS

Carload lots, f.o.b. Pittsburgh and Cleveland) After Dec. 31, extras of 10c. a 100 lb. on mixed and joint carloads, 25c. on pool carloads and 40c. or less than carloads will be applied on all merchant wire products.)

To Manufacturing Trade

Light wire	2.20c.
Spring wire	3.20c.

Rails

	Per Gross Ton
Standard, f.o.b. mill	\$43.00
Light (from billets), f.o.b. mill	34.00
Light (from rail steel), f.o.b. mill	32.00

To Jobbing Trade

	Base per Keg
Standard wire nails	\$1.95
Smooth coated nails	1.95
Galvanized nails	3.95
	Base per Lb.
Smooth annealed wire	2.35c.
Smooth galvanized wire	2.80c.
Polished staples	2.50c.

Galvanized staples	2.75c.
Barbed wire, galvanized	2.60c.
Woven wire fence, No. 9 gage, per net ton	\$55.00
Woven wire fence, No. 12½ gage and lighter, per net ton	60.00

Chicago and Anderson, Ind., mill prices are \$1 a ton over Pittsburgh base. Duluth, Minn., and Worcester, Mass., mill \$2 a ton over Pittsburgh, and Birmingham mill \$3 a ton over Pittsburgh.

RAILS AND TRACK SUPPLIES

Track Equipment

	Base per 100 Lb.
Spikes, 1/2-in. and larger	\$2.60
Spikes, 1/2-in. and larger	2.60
Spikes, boat and barge	2.80

Tie plate, steel	1.85
Angle bars	2.75
Track bolts, to steam railroads	3.50
Track bolts, to jobbers, all sizes, per 100 count	73 per cent off list

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

f.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent Off List

Machine bolts	75
Carriage bolts	75
Lag bolts	75
Plow bolts, Nos. 1, 2, 3 and 7 heads	75
Hot-pressed nuts, blank or tapped, square	75
Hot-pressed nuts, blank or tapped, hexagons	75
C.p.c. and t. square or hex. nuts, blank or tapped	75
Washers*	7.00c. to 6.75c. per lb. off list

*f.o.b. Chicago, New York and Pittsburgh.

Bolts with rolled thread up to and including 1/4-in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

Per Cent Off List

Semi-finished hexagon nuts	75
Semi-finished hexagon castellated nuts, S.A.E. 75	75
Stove bolts in packages, Pgh.	85 and 10
Stove bolts in packages, Ch'go	85 and 10
Stove bolts, in pkgs., Cleveland	85 and 10
Stove bolts in bulk, Pgh.	85, 10 and 2½
Stove bolts in bulk, Ch'go	85, 10 and 2½
Stove bolts in bulk, Cleveland	85, 10 and 2½
Tire bolts	60 and 10

Discount of 75 per cent off on bolts and nuts applies on carload business with jobbers and large consumers.

Large Rivets

1/2-in. and larger

	Base per 100 Lb.
P.f.o.b. Pittsburgh or Cleveland	\$2.25
P.f.o.b. Chicago	2.35

Small Rivets

5/8-in. and smaller

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S.S. thread	80, 10 and 10
Upset hex. cap screws, S.A.E. thread	85, 10 and 10
Upset set screws	80, 10 and 5
Milled studs	70

SEMI-FINISHED STEEL

Sheet Bars

(Open-Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	\$26.00
Youngstown	26.00
Cleveland	26.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	\$26.00 to \$27.00
Youngstown	26.00 to 27.00
Cleveland	26.00

Skelp

(f.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.50c. to 1.60c.
Universal	1.50c. to 1.60c.
Sheared	1.50c. to 1.60c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	\$37.00
Cleveland	37.00
Chicago	38.00

COKE, COAL AND FUEL OIL

Coke

Per Net Ton

Fire耐火 furnace, f.o.b. Connellsville	\$2.25
Foundry, f.o.b. Connellsville	
prompt	
prompt	
Foundry, Ch'go ovens	7.50
Foundry, by-product, New Eng- land, del'd	10.50
Foundry, by-product, Newark or Jersey City, delivered	8.70 to 9.10
Foundry, by-product, Phila.	9.00
Foundry, by-product, Cleveland, delivered	8.27

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.

No. 3 distillate	3.50c.
No. 4 industrial	3.00c.
No. 3 distillate	3.50c.
No. 4 industrial	3.25c.
No. 2 industrial fuel oil	2.75c.
No. 5 industrial fuel oil	2.60c.

Per Gal. del'd Chicago

No. 3 distillate	4.75c.
No. 4 distillate	4.00c.
No. 2 industrial fuel oil	2.75c.
No. 5 industrial fuel oil	2.60c.

Per Gal. f.o.b. Cleveland

No. 3 distillate	4.75c.
No. 4 distillate	4.00c.
No. 2 industrial fuel oil	2.75c.
No. 5 industrial fuel oil	2.60c.

Refractories

Illinois

Ground fire clay

per ton

6.50

Chrome Brick

Per Net Ton

Standard size

\$42.50

Silica Brick

Per 1000 f.o.b. Works

Pennsylvania

\$38.00

Chicago

47.00

CAST IRON PIPE

6-in. and larger, del'd New York

\$28.20

4-in. del'd New York

31.20

6-in. and larger, Birmingham

\$32.00 to 33.00

4-in., Birmingham

\$35.00 to \$36.00

Class "A" and gas pipe, \$3 extra.

Pig Iron Prices for All Districts

► VALLEY ◀

Per gross ton, f.o.b. Valley furnace:	
Basic	\$14.50
Bessemer	15.50
Gray forge	15.00
No. 2 foundry	15.00
No. 3 foundry	14.50
Malleable	15.50
Low phosphorus, copper free	25.00

Freight rate to Pittsburgh or Cleveland district, \$1.89.

► PITTSBURGH ◀

Per gross ton, f.o.b. Pittsburgh district furnace:	
Basic	\$15.00
No. 2 foundry	16.00
No. 3 foundry	15.50
Malleable	16.00
Bessemer	16.00

Freight rates to points in Pittsburgh district range from 69c. to \$1.26.

► CHICAGO ◀

Per gross ton at Chicago furnace:	
N'th'n No. 2 fdy	\$16.50
N'th'n No. 1 fdy	17.00
Malleable, not over 2.25 sil.	16.50
High phosphorus	16.50
Lake Super. charcoal, sil.	23.17
1.50, by rail	23.17
S'th'n No. 2 fdy	16.13
Low phosphorus, sil. 1 to 2, copper free	\$28.50 to 29.20
Silvery, sil. 8 per cent	23.67
Bess. ferrosilicon, 15 per cent	28.92

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnaces, not including a switching charge.

► ST. LOUIS ◀

Per gross ton at St. Louis:	
No. 2 fdy, sil. 1.75 to 2.25, f.o.b.	
Granite City, Ill.	\$17.50
Malleable, f.o.b. Granite City	17.50
N'th'n No. 2 fdy, del'd St. Louis	18.80
Southern No. 2 fdy, del'd., \$14.50 to 15.50	
Northern malleable, deliv'd.	18.80
Northern basic, deliv'd.	18.80

Freight rates: 83c. (average) Granite City to St. Louis; \$2.50 from Chicago; \$4.56 from Birmingham.

Prices of Ores, Ferroalloys and Fluorspar

Ores

Iron-Sulfur Ores, Delivered Tones Lake Ports

Per Gross Ton	
Old range Bessemer, 51.50% iron	\$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

Per Unit	
Iron, low phosphorus, copper free, 55 to 58%	
iron, dry Spanish or Algerian, 8c. to 8.50c.	
Iron, low phosphorus, Swedish, aver. 68% iron	9.00c.
Iron, basic or foundry, Swedish, average 65% iron	8.00c.
Iron, basic and foundry, Russian, average 63% iron (nom.)	9.00c.
Manganese, Caucasian, washed 52%	21.00c.
Manganese, African, Indian, 50-52% 23c. to 24c.	
Manganese, Brazilian, 46 to 48% 22c. to 23c.	

Per Gross Ton	
Tungsten, Chinese wolframite	\$11.00 to \$11.25
Tungsten, domestic scheelite	9.50 to 10.00
Chrome, 45% Cr ₂ O ₃ , crude, c.i.f. Atlantic seaboard	\$18.00
Chrome, 48% Cr ₂ O ₃ , c.i.f. Atlantic seaboard	20.00

Ferromanganese

Per Gross Ton	
Domestic, 80% sea board	*\$72.00 to \$75.00
Foreign, 80% Atlantic or Gulf port, duty paid	*\$72.00 to 75.00

*Minimum price quoted for lots of 2000 tons or more.

► NEW YORK ◀

Per gross ton, delivered New York district:

Buffalo, No. 2, del'd. east	
N. J.	\$17.91 to \$18.41
East. Pa. No. 2 fdy	17.02 to 17.52
East. Pa. No. 2X fdy	17.52 to 18.02

Freight rates: \$1.52 to \$2.63 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of \$3.41 a ton from Buffalo.

► BUFFALO ◀

Per gross ton, f.o.b. furnace:

No. 2 fdy	\$16.00
No. 2X fdy	16.50
No. 1 fdy	17.50
Malleable, sil. up to 2.25	16.50
Basic	15.50
Lake Superior charcoal, del'd.	23.41

► NEW ENGLAND ◀

Per gross ton delivered to most New England points:

Buffalo, sil. 1.75 to 2.25	\$20.04
Buffalo, sil. 2.25 to 2.75	20.04
Ala. sil. 1.75 to 2.25	19.74
Ala. sil. 2.25 to 2.75	20.24
Ala. sil. 2.25 to 2.75	15.88
Ala. sil. 2.25 to 2.75	16.28

Freight rates: \$5.04 all rail from Buffalo; \$9.75 all rail from Alabama and \$5.88 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

► CINCINNATI ◀

Per gross ton, delivered Cincinnati:

Ala. fdy, sil. 1.75 to 2.25	\$13.82
Ala. fdy, sil. 2.25 to 2.75	14.32
Tenn. fdy, sil. 1.75 to 2.25	13.82
N'th'n No. 2 foudry	\$17.01 to 17.59

S'th'n Ohio silvery, 8 per cent

22.02

Freight rates: \$2.02 from Ironton and Jackson, Ohio; \$3.82 from Birmingham.

► PHILADELPHIA ◀

Per gross ton at Philadelphia:

East. Pa. No. 2	\$15.64 to \$16.14
East. Pa. No. 2X	16.14 to 16.64
East. Pa. No. 1X	16.64 to 17.14
Basic (del'd. east. Pa.)	18.00 to 18.50
Stand. low phos. (f.o.b. east. Pa. furnace)	22.00 to 23.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 22.50
Va. No. 2 plain	22.04
Va. No. 2X	22.54

Prices, except as specified otherwise, are delivered Philadelphia. Freight rates: 8c. to \$1.79 from eastern Pennsylvania furnaces; \$4.67 from Virginia furnaces.

► CLEVELAND ◀

Per gross ton at Cleveland furnace:

N'th'n No. 2 fdy, local delivery	\$15.50
S'th'n fdy, sil. 1.75 to 2.25	16.14
Malleable (local delivery)	15.50
Ohio silvery, 8 per cent	21.87

Stand. low phos., Valley

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 55c. average local switching charge; \$3.12 from Jackson, Ohio; \$6.14 from Birmingham.

► BIRMINGHAM ◀

Per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy, 1.75 to 2.25 sil.	\$11.00
No. 2 soft, 2.25 to 2.75 sil.	11.50
Basic	11.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 55c. average local switching charge; \$3.12 from Jackson, Ohio; \$6.14 from Birmingham.

► CANADA ◀

Per gross ton:

Delivered Toronto	
No. 1 fdy, sil. 2.25 to 2.75	\$22.60
No. 2 fdy, sil. 1.75 to 2.25	22.10
Malleable	22.60

Delivered Montreal

No. 1 fdy, sil. 2.25 to 2.75	\$24.00
No. 2 fdy, sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	\$23.00 to 23.50

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 55c. average local switching charge; \$3.12 from Jackson, Ohio; \$6.14 from Birmingham.

► CANADA ◀

Per gross ton:

Delivered Toronto	
No. 1 fdy, sil. 2.25 to 2.75	\$22.60
No. 2 fdy, sil. 1.75 to 2.25	22.10
Malleable	22.60

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 55c. average local switching charge; \$3.12 from Jackson, Ohio; \$6.14 from Birmingham.

► CANADA ◀

Old Material Quotations

PITTSBURGH

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$10.00 to \$10.50
No. 2 heavy melting steel	8.75 to 9.25
No. 2 railroad wrought	10.00 to 10.50
Scrap rails	10.00 to 10.50
Rails 3 ft. and under	12.00 to 12.50
Sheet bar crops, ordinary	11.00 to 11.50
Compressed sheet steel	9.75 to 10.25
Hand bundled sheet steel	8.50 to 9.00
Hvy. steel axle turnings	9.00 to 9.50
Machine shop turnings	6.75 to 7.25
Short shov. steel turnings	6.75 to 7.25
Short mixed borings and turnings	6.75 to 7.25
Cast iron borings	6.75 to 7.25
Cast iron carwheels	9.75 to 10.25
Heavy breakable cast	8.00 to 8.50
No. 1 cast	9.00 to 10.00
Rail knuckles and couplers	10.50 to 11.00
Rail, coil and leaf springs	10.50 to 11.00
Rolled steel wheels	10.50 to 11.00
Low phos. billet crops	13.00 to 13.50
Low phos. sheet bar crops	12.50 to 13.00
Low phos. plate scrap	11.00 to 11.50
Low phos. punchings	11.00 to 11.50
Steel car axles	15.00 to 15.50

CLEVELAND

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$7.25 to \$7.75
No. 2 heavy melting steel	6.50 to 7.00
Compressed sheet steel	7.00 to 7.25
Light bundled sheet stampings	6.00 to 6.50
Drop forge flashings	6.00 to 6.25
Machine shop turnings	4.00 to 4.25
Short shoveling turnings	5.75 to 6.25
No. 1 busheling	6.50 to 6.75
Steel axle turnings	7.50 to 8.00
Low phos. billet crops	14.00 to 14.50
Cast iron borings	5.75 to 6.00
Mixed borings and short turnings	5.75 to 6.00
No. 2 busheling	5.75 to 6.00
No. 1 cast	9.00 to 9.50
Railroad grate bars	6.00 to 6.50
Stove plate	6.00 to 6.50
Rails under 3 ft.	12.00 to 12.50
Rails for rolling	11.00 to 12.00
Railroad malleable	9.50 to 10.00

NEW YORK

Dealers' buying prices per gross ton:	
No. 1 heavy melting steel	\$4.25 to \$5.50
No. 2 heavy melting steel	3.75 to 4.50
Heavy melting steel (yard)	2.75 to 3.00
No. 1 hvy. breakable cast	5.00 to 5.50
Stove plate (steel works)	3.00 to 3.50
Machine shop turnings	1.00 to 1.50
Short shoveling turnings	1.00 to 1.50
Cast borings	1.00 to 1.50
No. 1 blast furnace	1.00 to 1.50
Steel car axles	10.00 to 10.50
Iron car axles (nom.)	14.00 to 14.50
Spec. iron and steel pipe	5.00
Forge fire	3.25
No. 1 railroad wrought	5.00 to 5.25
No. 1 yard wrought, long	4.00 to 4.25
Rails for rolling	6.00 to 6.25
Stove plate (foundry)	4.75 to 5.25
Malleable cast (railroad)	6.00 to 6.50
Cast borings (chemical)	8.00 to 8.50

Per gross ton, delivered local foundries:

No. 1 machinery cast	\$8.50
No. 1 hvy. cast (cupola size)	7.50
No. 2 cast	6.50

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:	
No. 1 heavy melting steel	\$8.00
No. 2 heavy melting scrap	6.50
Scrap rails	\$8.00 to 8.50
New hydraulic comp. sheets	6.50
Old hydraulic comp. sheets	5.50
Drop forge flashings	6.50
Hvy. steel axle turnings	6.50 to 7.00
Machine shop turnings	5.00
Knuckles and couplers	10.00
Coll and leaf springs	10.00
Rolled steel wheels	10.00
Low phos. billet crops	12.00 to 12.50
Short shov. steel turnings	6.50 to 7.00
Short mixed borings and turnings	6.00 to 6.50
Cast iron borings	6.00 to 6.50
No. 2 busheling	3.50 to 4.00
Steel car axles	10.00 to 11.00
Iron axles	12.00 to 12.50
No. 1 machinery cast	9.25 to 9.75
No. 1 cupola cast	8.75 to 9.00
Stove plate	8.25 to 8.75
Steel rails, 3 ft. and under	11.50 to 12.00
Cast iron carwheels	9.00 to 9.50
Industrial malleable	9.00 to 9.50
Railroad malleable	9.00 to 9.50
Chemical borings	8.50 to 9.00

BIRMINGHAM

Per gross ton delivered consumers' yards:	
Heavy melting steel	\$7.50 to \$8.00
Scrap steel rails	8.00 to 8.50
Short shoveling turnings	3.50 to 4.00
Stove plate	6.00
Steel axles	12.00 to 12.50
No. 1 railroad wrought	6.00 to 6.50
No. 2 railroad wrought	6.25 to 6.50
No. 1 busheling	4.75 to 5.25
No. 2 busheling	2.50 to 3.00
Locomotive tires, smooth	8.00 to 9.00
Pipes and flues	3.25 to 3.75
No. 1 machinery cast	7.00 to 7.50
Clean automobile cast	6.75 to 7.25
No. 1 railroad cast	6.25 to 6.75
No. 1 agricultural cast	5.75 to 6.25
Stove plate	5.50 to 6.00
Grate bars	5.50 to 6.00
Brake shoes	6.50 to 7.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

PHILADELPHIA

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$7.00 to \$7.75
No. 2 heavy melting steel	5.50 to 6.00
No. 1 railroad wrought	8.50 to 9.00
Bundled sheets	6.00
Hydraulic compressed, new	6.00 to 6.50
Hydraulic compressed, old	5.00 to 5.50
Machine shop turnings	4.00 to 4.50
Heavy axle turnings	6.00 to 6.50
Cast borings (nom.)	3.50
Heavy breakable cast	9.00
Stove plate (steel works)	7.00
No. 1 low phos. hvy.	10.00 to 11.00
Couplers and knuckles	8.00 to 8.50
Rolled steel wheels	8.00 to 8.50
No. 1 blast furnace	3.50
Spec. iron and steel pipe	9.50 to 10.50
Shafting	12.50 to 13.50
Steel axles	14.50 to 15.00
No. 1 forge fire	6.00
Cast iron carwheels	9.50 to 10.00
No. 1 cast	10.00 to 10.50
Cast borings (chem.)	10.00 to 11.00
Steel rails for rolling	9.50 to 10.00

ST. LOUIS

Dealers' buying prices per gross ton:	
Selected heavy steel	\$7.00 to \$7.50
No. 1 heavy melting	6.25 to 6.75
No. 2 heavy melting	5.75 to 6.25
No. 1 locomotive tires	6.50 to 7.00
Misc. stand-see, rails	7.50 to 7.75
Railroad springs	8.50 to 9.00
Bundled sheets	4.25 to 4.75
No. 1 railroad wrought	6.25 to 6.75
No. 1 busheling	5.50 to 6.00
Cast iron borings and shoveling turnings	4.75 to 5.25
Iron rails	7.00 to 8.00
Rails for rolling	9.00 to 9.50
Machine shop turnings	3.00 to 3.50
Heavy turnings	5.00 to 5.50
Steel car axles	9.50 to 10.00
Iron car axles	13.25 to 13.75
Wrot. iron bars and trans.	5.00 to 5.50
No. 1 railroad wrought	4.75 to 5.25
Steel angle bars	6.50 to 7.00
Cast iron carwheels	6.00 to 6.50
No. 1 machinery cast	8.00 to 8.50
Railroad malleable	5.00 to 5.50
No. 1 railroad cast	6.25 to 6.75
Stove plate	6.00 to 6.50
Relay. rails, 60 lb. and under	16.00 to 16.50
Relay. rails, 70 lb. and over	20.00 to 21.00
Agricult. malleable	5.00 to 5.50

DETROIT

Dealers' buying prices per gross ton:	
Hvy. melting	\$5.75 to \$6.25
Borings and short turnings	4.00 to 4.50
Long turnings	3.25 to 3.75
No. 1 machinery cast	8.75 to 9.00
Automotive cast	10.75 to 11.25
Hydraulic comp. sheets	5.75 to 6.25
Stove plate	4.50 to 5.00
New No. 1 busheling	4.75 to 5.25
Old No. 2 busheling	3.00 to 3.50
Sheet clippings	3.25 to 3.75
Flashings	4.75 to 5.25

CINCINNATI

Dealers' buying prices per gross ton:	
Heavy melting steel	\$6.00 to \$7.00
Scrap rails for melting	8.00 to 8.50
Loose sheet clippings	2.00 to 2.50
Bundled sheets	4.75 to 5.25
Cast iron borings	2.75 to 3.25
Machine shop turnings	3.25 to 3.75
No. 1 busheling	4.25 to 4.75
No. 2 busheling	2.50 to 3.00
Rails for rolling	9.00 to 9.50
No. 1 locomotive tires	8.50 to 9.00
Short rails	11.75 to 12.25
Cast iron carwheels	8.25 to 8.75
No. 1 machinery cast	10.00 to 10.50
No. 1 railroad cast	8.75 to 9.25
Burnt cast	4.25 to 4.75
Stove plate	4.25 to 4.75
Agricultural malleable	8.00 to 8.50
Railroad malleable	9.00 to 9.50

CANADA

Dealers' buying prices per gross ton:	
Toronto	Montreal
Heavy melting steel	\$7.00
Rails, scrap	7.00
No. 1 wrought	6.00
Machine shop turnings	2.00
Boiler plate	5.00
Heavy axle turnings	2.50
Cast borings	2.00
Steel borings	2.00
Wrought pipe	2.00
Steel axles	7.00
Axes, wrought iron	7.00
No. 1 machinery cast	12.50
Stove plate	16.00
Standard carwheels	11.00
Malleable	10.00

Warehouse Prices for Iron and Steel Products

CHICAGO

	Base per Lb.
Plates and structural shapes	3.00c.
Soft steel bars	2.75c.
Reinforcing bars, billet steel	1.75c.
Rail steel reinforcement	1.55c. to 1.65c.
Cold-fin, steel bars and shafting—	
Rounds and hexagons	3.10c.
Flats and squares	3.60c.
Bands, $\frac{1}{2}$ in. (in Nos. 10 and 12 gages)	2.95c.
Hoops (No. 14 gage and lighter)	3.50c.
Hot-rolled annealed sheets (No. 24)	3.55c.
Galv. sheets (No. 24)	4.10c.
Hot-rolled sheets (No. 10)	3.20c.
Spikes ($\frac{3}{4}$ in. and lighter)	3.45c.
Track bolts	4.30c.
Rivets, structural	3.75c.
Rivets, boiler	3.75c.
Per Cent Off List	
Machine bolts	73
Carriage bolts	73
Coach and lag screws	73
Hot-pressed nuts, sq., tap, or blank	73
Hot-pressed nuts, hex., tap, or blank	73
No. 8 black ann'l'd wire, per 100 lb.	\$3.45
Com. wire nails, base per keg	2.30
Cement c't'd nails, base per keg	2.30

CLEVELAND

	Base per Lb.
Plates and struc. shapes	2.95c.
Soft steel bars	2.75c.
Reinfor. steel bars	1.75c. to 1.95c.
Cold-fin, rounds and hex	3.10c.
Cold-fin, flats and sq	3.60c.
Hoops and bands, No. 12 to $\frac{1}{2}$ in., inclusive	3.00c.
Hoops and bands, No. 13 and lighter	3.55c.
Cold-finished strip	3.55c.
Hot-rolled annealed sheets (No. 24)	3.25c.
Galvanized sheets (No. 24)	3.75c.
Hot-rolled sheets (No. 10)	3.00c.
Black ann'l'd wire, per 100 lb.	\$2.75
No. 9 galv. wire, per 100 lb.	3.20
Com. wire nails, base per keg	2.35

*Net base, including boxing and cutting to length.

CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
New billet reinforce. bars	3.00c.
Rail steel reinforce. bars	3.00c.
Hoops	3.90c.
Bands	3.20c.
Cold-fin, rounds and hex	3.50c.
Squares	4.00c.
Hot-rolled annealed sheets (No. 24)	3.75c.
Galv. sheets (No. 24)	4.25c.
Hot-rolled sheets (No. 10)	3.20c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	\$3.00
Com. wire nails, base per keg (10 to 49 kegs)	2.65
Larger quantities	2.50
Cement c't'd nails, base 100-lb. keg	2.95
Chain, per 100 lb.	10.25
Net per 100 Ft.	
Seamless steel boiler tubes, 2-in.	\$17.50
4-in.	26.00
Lap-welded steel boiler tubes, 2-in.	16.50
4-in.	34.50

BUFFALO

	Base per Lb.
Plates and struc. shapes	3.25c.
Soft steel bars	3.00c.
Reinforcing bars	2.65c.
Cold-fin, flats and sq.	3.65c.
Rounds and hex	3.15c.
Cold-rolled strip steel	3.25c.
Hot-rolled annealed sheets (No. 24)	3.70c.
Galv. sheets (No. 24)	4.10c.
Bands	3.35c.
Hoops	3.90c.
Hot-rolled sheets (No. 10)	3.50c.
Com. wire nails, base per keg	\$2.45
Black wire, base per 100 lb.	3.20

NEW YORK

	Base per Lb.
Plates and struc. shapes	2.70c. to 3.10c.
Soft steel bars, small shapes	2.70c. to 3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	6.00c. to 6.50c.
Cold-fin, shafting and screw stock:	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-rolled strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Hot-rolled sheets (No. 10)	3.00c. to 3.25c.
Hot-rolled ann'l'd sheets (No. 24*)	3.60c.
Galvanized sheets (No. 24*)	4.00c.
Long term sheets (No. 24)	5.00c.
Standard tool steel	12.00c.
Wire, black annealed (No. 10)	3.60c.
Wire, galv. annealed (No. 10)	4.05c.
Tire steel, $\frac{1}{2}$ x $\frac{1}{2}$ in. and larger	3.40c.
Smooth finish, 1 to $2\frac{1}{2}$ x $\frac{1}{4}$ in. and larger	3.75c.
Open-hearth spring steel, bases	4.50c. to 7.00c.
Common wire nails, base per keg	\$2.60
Per Cent	
Machine bolts, cut thread:	Off List
$\frac{3}{4}$ x 6 in. and smaller	.65 to 65 and 10
1 x 30 in. and smaller	.65 to 65 and 10
Carriage bolts, cut thread:	
$\frac{3}{4}$ x 6 in. and smaller	.65 to 65 and 10
$\frac{3}{4}$ x 20 in. and smaller	.65 to 65 and 10
Boiler Tubes:	Per 100 Ft.
Lap welded, 2-in.	\$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
Cold-fin, rounds, shafting, screw stock	3.35c.
Hot-rolled annealed sheets (No. 24)	3.80c.
Galv. sheets (No. 24)	4.25c.
Hot-rolled sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	3.85c.
Galv. corrug. sheets	4.40c.
Structural rivets	4.00c.
Boiler rivets	4.00c.
Per Cent Off List	
Tank rivets, $\frac{1}{2}$ -in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	73
Carriage bolts	73
Lag screws	73
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	73
Less than 200 lb.	63
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	73
Less than 200 lb.	63

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

PACIFIC COAST

	Base per Lb.
San	
Francisco	
Los Angeles	
Seattle	
Plates and struc. shapes, $\frac{1}{4}$ -in. and heavier	3.15c. 3.15c. 2.75c.
Soft steel bars	3.15c. 3.15c. 2.75c.
Reinforcing bars	2.80c. 2.80c. 3.00c.
Hot-rolled annealed sheets (No. 24)	3.95c. 4.05c. 4.25c.
Hot-rolled sheets (No. 10)	3.50c. 3.50c. 3.75c.
Galv. sheets (No. 24)	4.55c. 4.35c. 4.75c.
Struct. rivets, $\frac{1}{2}$ in. and larger, less than 1000 lb.	5.00c. 5.00c. 4.00c.
Cold-finished steel bars and shafting:	
Rounds	5.25c. 5.15c. 4.50c.
Squares	6.25c. 6.15c. 5.75c.
Hexagons	6.25c. 5.15c. 5.75c.
Flats	6.75c. 6.15c. 6.75c.
Common wire nails, base per keg, in less carloads	\$2.75 \$2.75 \$2.75
Plates, shapes, bars, bands and hot-rolled sheets, No. 16 gage and heavier, subject to group differentials	
Cold-finished steel bars and shafting, subject to warehouse differentials for quantity	
All prices f.o.b. warehouse	

PITTSBURGH

	Base per Lb.
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.60c.
Reinforcing steel bars	2.60c.
Cold-finished and screw stock—	
Rounds and hexagons	3.10c.
Squares and flats	3.60c.
Bands	2.95c.
Hoops	3.60c.
Hot-rolled annealed sheets (No. 24)	3.15c.
Galv. sheets (No. 24), 25 or more bundles	3.65c.
Hot-rolled sheets (No. 10)	3.10c.
Galv. corrug. sheets (No. 28), per square (less than 3750 lb.)	\$3.74
Spikes, large	2.50c.
Small	2.75c. to 2.90c.
Boat	3.00c.
Track bolts, all sizes, per 100 count, 70 and 10 per cent off list	
Machine bolts, 100 count, 70 and 10 per cent off list	
Carriage bolts, 100 count, 70 and 10 per cent off list	
Nuts, all styles, 100 count, 70 and 10 per cent off list	
Large rivets, base per 100 lb.	\$3.00
Wire, black, soft ann'l'd, base per 100 lb.	2.75
Wire, galv., soft, base per 100 lb.	3.20
Common wire nails, per keg	2.35
Cement coated nails, per keg	2.35

*On plates, structural, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

PHILADELPHIA

	Base per Lb.
Plates, $\frac{1}{4}$ -in. and heavier	2.45c.
Structural shapes	2.45c.
Soft steel bars, small shapes, iron bars (except bands)	2.45c.
Reinfor. steel bars, sq. twisted and deform	2.30c.
Cold-fin. steel, rounds and hex	3.30c.
Cold-fin. steel, sq. and flats	3.80c.
Steel hoops	3.00c.
Steel bands, No. 12 to $\frac{1}{2}$ -in., incl.	2.75c.
Spring steel	5.00c.
Hot-rolled annealed sheets (No. 24)	3.55c.
Galvanized sheets (No. 24)	3.75c.
Hot-rolled and annealed sheets (No. 10)	3.05c.
Diam. pat. floor plates, $\frac{1}{4}$ in.	5.00c.
Swedish iron bars	6.60c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

BOSTON

	Base per Lb.
Plates	*3.35c.
Structural shapes	*3.35c.
Soft steel bars, small shapes	*3.25c.
Reinforcing bars	3.10c. to 3.25c.
Iron bars	
Refined	3.25c.
Best refined	4.60c.
Spring steel, open-hearth	4.50c. to 4.75c.
Tire steel	
4-in.	4.50c. to 4.75c.
Bands	*3.75c. to 4.25c.
Hoop steel	4.90c. to 5.40c.
Cold-rolled steel—	
Rounds and hex	3.50c. to 5.50c.
Squares and flats	4.00c. to 6.00c.
Rivets, structural or boiler	4.80c.
Per Cent Off List	
Machine bolts	70
Carriage bolts	70
Lag screws	40 and 10
Hot-pressed nuts	40 and 10
Cold-punched nuts	40 and 10
Stove bolts	70 and 10

*Base price (250 to 999 lb.); less than 250 lb., add 50c. per 100 lb.; 1000 to 7999 lb., deduct 15c.; 8000 to 14,999 lb., deduct 25c.; 15,000 lb. and larger lots, deduct 35c.

Copper Firmer at Lower Levels; Lead and Tin Have Also Declined

NEW YORK, March 15.—Although demand has not perceptibly improved, the copper market has assumed a firm undertone. The stronger position is attributable to the recent announcement by Copper Exporters, Inc., to the effect that the producers' conference resulted in an agreement to curtail production further, provided that the mining companies not represented at the conference are willing to cooperate; and that in expectation of such cooperation producers and custom smelters have agreed to continue to cooperate in the market through Copper Exporters, Inc. Although the agreement provides for restricting production to 20 per cent of total capacity, a number of mines will be unable to operate at the reduced rate and will consequently have to suspend operations completely. As a result, when the curtailment program becomes effective in its entirety, it is expected that total production will fall far below the rate agreed upon.

Electrolytic copper is procurable for shipment into third quarter at

6c. a lb., delivered Connecticut Valley. Few sales, however, are being made. Copper Exporters, Inc., has disposed of moderate tonnages at a special price of 6.12½c. a lb., c.i.f. usual European ports. Export sales so far this month aggregate about 12,000 tons. Lake copper is nominal at 6.12½c. delivered.

Lead

In an effort to move stocks that have accumulated in the rather dull market in the past few weeks, leading smelters reduced prices today to 3.15c., New York, and 3c., St. Louis, the lowest quotations named in the last 40 years. The new prices are for March-April delivery.

Tin

A substantial amount of consumer buying for prompt delivery was transacted in the past week. The improved demand has drawn heavily on nearby stocks in the United States, and heavier shipments from abroad are likely to result. A 250-ton consignment from Rotterdam is expected to

arrive for March delivery. Domestic prices are somewhat easier, with today's quotation 21.65c. Today's London market is £128 a ton for spot standard, £129 15s. for future standard and £130 15s. for spot Straits. The Singapore market today is £134 7s. 6d. Shipments from the East have fallen below the estimate of 5000 tons for the month, with the total up to March 12 amounting to only 1403 tons. United Kingdom warehouse stocks decreased 27 tons last week to 33,498 tons.

Zinc

The market is quiet and unchanged, with prices well maintained at 3.17c., New York, and 2.80c., East St. Louis. Production of slab zinc in the United States in 1931 was 313,621 net tons, consisting of 291,996 tons of primary metal and 21,625 tons of secondary metal, according to Department of Commerce. Production last year was 219,273 tons, or 41 per cent, less than that in 1930.

Antimony

Demand is lacking and prices are nominal, with spot metal quotable at 6.20c., f.o.b. New York, and futures at 3.80c., c.i.f. New York. Production of Chinese antimony products in 1931 was 13,298 gross tons, a decrease of 9½ per cent from the 1930 output of 14,700 tons, according to Department of Commerce. Changsha stocks at the end of last year were 1570 tons and Hankow stocks were 357 tons, compared with carryovers in 1930 of 500 tons at Changsha and 850 tons at Hankow.

The Week's Prices. Cost Per Pound for Early Delivery

	Mar. 9	Mar. 10	Mar. 11	Mar. 12	Mar. 13	Mar. 14	Mar. 15
Lake copper, New York	6.37½	6.37½	6.12½	6.12½	6.12½	6.12½	6.12½
Electrolytic copper, N. Y.*	5.75	5.75	5.75	5.75	5.75	5.75	5.75
Straits tin, spot, N. Y.	22.30	21.90	22.05	21.75	21.75	21.75	21.75
Zinc, East St. Louis	2.80	2.80	2.80	2.80	2.80	2.80	2.80
Zinc, New York	3.17	3.17	3.17	3.17	3.17	3.17	3.17
Lead, St. Louis	3.05	3.05	3.05	3.05	3.05	3.05	3.05
Lead, New York	3.25	3.25	3.25	3.25	3.25	3.25	3.25

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.
Aluminum, 98 to 99 per cent pure, 22.90c. a lb., delivered.
Nickel, electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 6.20c. a lb., New York.
Brass ingots, 85-5-5-5, 6.25c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	24.00c. to 25.00c.
Tin, bar	26.00c. to 28.00c.
Copper, Lake	8.00c. to 9.00c.
Copper, electrolytic	7.75c. to 8.75c.
Copper, casting	7.50c. to 8.50c.
*Copper sheets, hot-rolled	15.37½c.
*High brass sheets	12.50c.
*Seamless brass tubes	15.75c.
*Seamless copper tubes	14.87½c.
*Brass rods	10.25c.
*Brazed brass tubes	21.52½c.
Zinc, slab	4.25c. to 4.75c.
Zinc, sheets (No. 99), cans	9.25c. to 9.50c.
Lead, American pig	4.25c. to 4.75c.
Lead, bar	6.00c. to 7.00c.
Lead sheets	8.00c.
Antimony, Asiatic	9.00c. to 10.00c.
Alum, virgin, 99 per cent plus	23.30c.
Alum, No. 1 for remelting, 98 to 99 per cent	17.00c. to 18.00c.
Solder, ½ and ¼	15.00c. to 16.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

Metals from Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	26.25c.
Tin, bar	28.25c.

Copper, Lake	7.25c.
Copper, electrolytic	7.25c.
Copper, casting	7.00c.
Zinc, slab	4.25c. to 4.50c.
Lead, American pig	4.10c. to 4.40c.
Lead, bar	7.50c.
Antimony, Asiatic	10.00c.
Babbitt metal, medium grade	15.60c.
Babbitt metal, high grade	29.75c.
Solder, ½ and ¼	17.50c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	4.50c.
Copper, hvy. and wire	4.25c.
Copper, light and bottoms	3.50c.
Brass, heavy	2.25c.
Brass, light	1.75c.
Hvy. machine composition	3.50c.
No. 1 yel. brass turnings	4.00c.
No. 1 red brass or compos. turnings	3.00c.
Lead, heavy	2.25c.
Zinc	1.00c.
Cast aluminum	3.25c.
Sheet aluminum	8.50c.

Corporation Offices to Remain in New York

NEW YORK, March 15.—Myron C. Taylor, chairman of the finance committee, United States Steel Corp., today introduced William A. Irvin, president-elect of the corporation, to the press. Upon being questioned regarding the report that the Steel Corporation's general offices would be moved to Pittsburgh, Mr. Taylor stated that the rumor was without foundation.

Detroit Scrap Market Stagnant

DETROIT, March 15.—With virtually no consumer buying, the local scrap market is stagnant. Quotations, which are largely nominal, are unchanged.

PLANT EXPANSION AND EQUIPMENT BUYING

February Poor Month in Machine Tool Sales

FEBRUARY was the poorest month for machine tool sales in the depression period, according to the monthly tabulation of the National Machine Tool Builders' Association. The association's index figure declined to 37.6, compared with 59.1 for January and an average for 1931 of 73.9. The previous low figure was 44.5 in last October. The three-months' moving average stood at 54.8 at the end of February, which was above the figure for the end of November—50.4.

All classifications of companies that report to the machine tool association suffered declines in sales last month. The companies are arranged in three

groups: large, medium and small. Fourteen of 74 companies reporting had no orders in February. Shipments of most companies were smaller than those of January. The index figure for shipments—44.1—is a little less than half the shipping rate of the best months of 1931. Unfilled orders also declined to 97.1 from 108.2 for January. Average monthly shipments for 1922, 1923 and 1924 are used as a base for index figures.

From a purely statistical viewpoint, the poor record of machine tool sales may not be quite so bad as it appears, considering that for several months the figures have been making a "bottom." It is the experience of

Small Sales Bring Index Figure of Builders' Association to New Low

the association that the "bottoming" process is usually followed by a rising trend. Actual evidences of improvement are not yet in sight, but there is a feeling that machine tool business will go along with any gains in other branches of industry rather than following by several months, as has happened frequently in the past. This expectation is based on the known fact that many manufacturers are seriously considering the purchase of new equipment and will place their orders when there are conclusive signs of a rising trend in industry generally.

The starting of production by the Ford Motor Co. is expected to release orders from automotive parts makers.

New York

A few machine tool sellers report slightly more business and more interest in prospective purchases, but there has been no real awakening of demand. March may show a slight improvement over February in specific instances. Some of the larger companies in this district, whose sales extend over a wide territory, have experienced no improvement this month.

Cleveland

The machinery trade expects that the starting of production by the Ford Motor Co. will prove helpful in creating some demand from automobile parts makers. However, releases by the Ford company to parts plants in this territory so far have been only for small lots. The market continues dull in both sales and inquiries. Some new prospective business has developed from manufacturers planning to add new products to present lines. The Westinghouse Electric & Mfg. Co., during the week, purchased a 275-ton double crank Toledo press for its Mansfield works. This will have magnetic clutch, 4-station control and electric brake, and will be provided with a Marquette cushion bed. The General Electric Co., through its Cleveland office, has taken a 15,000-kw. turbine for the Richmond, Ind., municipal power plant.

Milwaukee

While demand for machine tools has not been accelerated greatly, opinion is that it is somewhat better, judging by the increase in inquiries. Most prospective customers, however, seem unwilling to place orders until the tools are actually needed.

Cincinnati

Extreme quiet pervades the machine tool market. Demand is spotty and consists of scattered single orders. Inquiry has slackened and while local manufacturers have a large number of old inquiries pending, there is nothing to indicate that users will close on these soon.

Chicago

New developments are extremely scarce. Fresh inquiries appear to have touched a new low and many old projects have all but passed from consideration. The only news from the railroads is that the Santa Fe has decided not to compile a list, but rather to buy equipment as it is required. The Jewel Electrical Instrument Co., Chicago, is preparing to liquidate its shop equipment.

Pittsburgh

Machine tool sellers report users are still showing more interest in prospective purchases. Some of this

is resulting in definite inquiry, others are merely asking for prices for estimating purposes. Sizable lists are almost entirely lacking, but the Board of Education, Pittsburgh, will take bids March 15 on a number of small tools for the manual training shops of the Arsenal and Prospect junior high schools. The Pittsburgh Equitable Meter Co. is still said to be in the market for a few tools.

◀ NEW YORK ▶

Department of Sanitation, Municipal Building, New York, is securing sites for four new incinerator plants for refuse disposal. Estimated cost \$4,100,000 with power houses, conveying, unloading and other mechanical handling and disposal equipment.

American Can Co., 230 Park Avenue, New York, is organizing subsidiary to operate in Alaska, and plans establishment of plant facilities there.

Superintendent of Lighthouses, Staten Island, N. Y., asks bids until March 21 for 75-ft. tower and beacon lights at New Hackensack (Proposal 39386).

Fabricated Steel & Mfg. Corp., Coxsackie, N. Y., has been organized by Frederick L. Sleaster, 265 East 201st Street, and Simon Weiss, 541 West 204th Street, New York, capital \$75,000, to manufacture steel and other metal products.

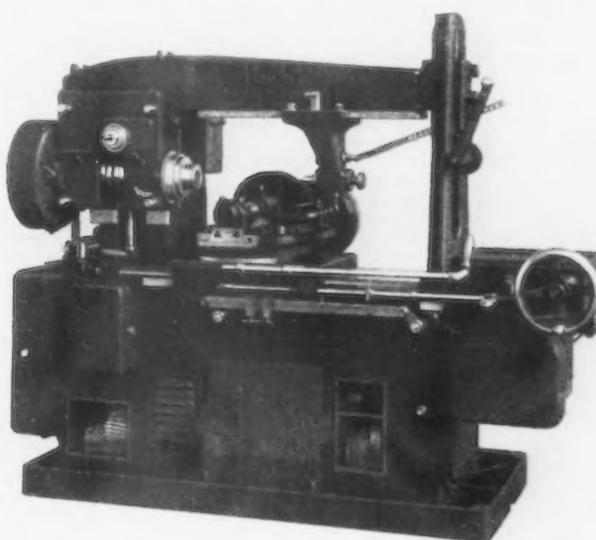
North American Co., 60 Broadway, New York, operating electric light and power utilities, and gas properties in different parts of country including Pacific Coast, has fund of about \$19,000,000 for operations, expansion and improvements in 1932, including increased power facilities, transmission and distributing lines, power substations, etc.

Bureau of Supplies and Accounts, Navy Department, Washington, and Navy Purchasing Office, New York, asks bids until March 22

Barber-Colman Type A Hobbing Machine

What it is

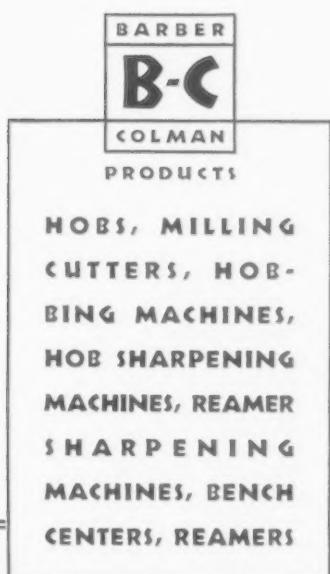
The Barber-Colman Type A Hobbing Machine is a further development of our No. 12 Hobbing Machine. The Type A, as compared to the No. 12, has slightly larger capacity, is more rugged, more highly accurate. Separate units, which are provided in the form of attachments for the No. 12, are built into the Type A. Certain improvements, such as the one-shot lubrication system, one piece steel way-guards and a rapid unloading device are provided in our Type A Hobbing Machine. It is the product of years of experience in building commercial Hobbing Machines.



What it does

The Type A Hobbing Machine might well be termed a "universal" model, because it will handle any form, within its capacity, which can be generated by the hobbing process. It is an excellent machine for high production because it can be set up easily, quickly and accurately. It has the power to pull heavy cuts, the strength to carry the loads and maintain alignment, the rigidity to resist vibration and the development of "chatter". The Type A generates forms which are highly accurate both as to shape and spacing.

The combination of high productive capacity and accuracy, offered by our Type A Hobbing Machine, provides manufacturers who use the hobbing process, or who can use it, with a powerful means for maintaining net profits even under adverse conditions. Write for complete details. For reliable production estimates, send drawings and samples to us or let us send a Barber-Colman engineer to you.



BARBER-COLMAN COMPANY
General Offices and Plant ROCKFORD, ILLINOIS, U. S. A.

THE IRON AGE...MARCH 17, 1932
Page 16

for one electric arc welding set (Schedule 7641), 50,000 ft. acetylene and hydrogen gas hose (Schedule 7656), quantity of corrosion resisting steel valves (Schedule 7698), 47,200 lb. pig lead (Schedule 7660); until March 29 for repair parts for 500 oxygen tank closing valves, high pressure and reducer assembly fittings, gage tubes, etc. (Schedule 7649), 29 air motors (Schedule 7672) for New York Navy Yard.

Skala Metal Products Co., Inc., New York, has been organized by John Skala, 3408 Thirtieth Street, and Henry A. Schmidt, 506 First Avenue, both Long Island City, capital \$50,000, to manufacture metal products.

Clarence Chamberlin, 372 Lembeck Avenue, Jersey City, N. J., operating at former plant of Crescent Aircraft Corp., has leased hangar No. 4 at Floyd Bennett Air Field, Brooklyn, and will equip as school for airplane mechanics and pilots. Plant at Jersey City, noted, will be developed for repair shop for mechanics' course.

Taylor-Wharton Iron & Steel Co., High Bridge, N. J., is carrying out improvements, including consolidation of several shops. Unit heretofore known as Lower Foundry will be abandoned and operations provided at main works.

Tru-Lite Electric Lamp Co., Newark, N. J., has been organized by Otto Granick, 98 Lyons Avenue, and associates, capital \$135,000, to manufacture electric lamps. Same interests have also formed Nu-Lite Electric Co., with capital of \$125,000 to manufacture electrical appliances and equipment.

Kolster Radio, Inc., 360 Thomas Street, Newark, N. J., subsidiary of International Telephone & Telegraph Corp., 67 Broad Street, New York, is increasing operations and adding over 200 employees to working force. Company has arranged with Westinghouse Electric Supply Co. for manufacture of radio receivers.

Thomas J. Lee, Inc., 495 Lyons Avenue, Irvington, N. J., plumbing equipment and supplies, will take bids soon for two-story and basement storage and distributing plant, 50 x 200 ft., with pipe shop and other mechanical units. Cost over \$50,000 with equipment. Neil J. Convery, 32 Walnut Street, Newark, is architect.

◀ BUFFALO ▶

Irving Air Chute Co., 374 Pearl Street, Buffalo, manufacturer of air chutes, aircraft equipment, etc., let general contract to John W. Cowper Co., Inc., Rand Building, for new one-story plant, 80 x 160 ft. Cost about \$50,000 with equipment.

Niagara Hudson Power Corp., Syracuse, N. Y., authorized fund of \$19,301,000 for extensions and improvements in electric light and power and gas properties in different parts of State, including \$1,000,000 for hydroelectric power stations, \$815,000 for steam-electric generating plants, \$5,706,000 for steel tower and other transmission lines, \$7,825,000 for electric distributing lines, including about 350 miles of rural system, \$1,933,000 for new buildings, and \$2,222,000 for extensions and betterments in gas systems, including pipe lines, etc. Company operates Syracuse Lighting Co. and other utilities.

Syracuse Bodies, Inc., Syracuse, N. Y., has been organized by John R. C. Hodgson, Dewitt, N. Y., and Willard B. Smith, North Syracuse, to manufacture automobile bodies.

Dahlstrom Metallic Door Co., Jamestown, N. Y., will increase operations, giving employment to about 300 men. Company has secured large contract for hollow metal doors and apertures from Metropolitan Square Corp., New York, for Rockefeller Radio City project, requiring about 7000 tons of steel for 25,000 doors, frames and steel bucks, 2,400,000 lin. ft. hollow metal base and picture molding, 11,000 bronze door saddles, 3000 elevator entrances, and about 200 specially decorated metallic doors. All production will be carried out at Jamestown plant except steel bucks, which will be manufactured at branch plant at Brooklyn, N. Y.

◀ PHILADELPHIA ▶

Central Machine Works, Inc., Philadelphia, has been organized by William A. Thomas, 5933 Spruce Street, and Francis A. Schaeff, 323 East Meehan Street, to operate a general machine and repair works.

Depot Quartermaster, United States Marine Corps, 1100 South Broad Street, Philadelphia, asks bids until March 21 for 366 pistons (Req. 1631); until March 24 for 2800 padlocks (Schedule 653); until March 28 for 500,000 sq. ft. copper wire cloth (Schedule 633).

Bell Telephone Co. of Pennsylvania, 1835 Arch Street, Philadelphia, plans extensions in lines and equipment at Steelton, Pa., including new automatic exchange. Cost about \$135,000 with equipment.

Lemoyne Quarries Co., Lemoyne, Pa., is considering rebuilding part of plant recently destroyed by fire, including tool shop, crusher house and powder unit. Loss close to \$25,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, and Navy Yard, Philadelphia, asks bids until March 22 for 10,200 ft. phosphor bronze wire rope, and 24,600 ft. steel wire rope (Schedule 7658), 8400 lb. steel bars, and about 8000 lb. corrosion resisting steel (Schedule 7668); until March 29 for 75 antenna reels (Schedule 7644), 5700 lb. seamless steel tubing (Schedule 7639) for Philadelphia Navy Yard.

L. O. Beard Tool Co., East Marion Street, Lancaster, Pa., manufacturer of machine tools, plans rebuilding part of plant recently damaged by fire.

Motor Luggage Co., Hughesville, Pa., has been organized by Cleon B. and Walter E. Clark, Hughesville, to manufacture metal trunks for automobiles and kindred products.

◀ NEW ENGLAND ▶

Board of Trustees, Clarke School for Deaf, Round Hill, Northampton, Mass., has asked bids on general contract for two and one-half story vocational shop for boys, 44 x 96 ft. Cost about \$30,000 with equipment. Fechner & Thorst, Provident Bank Building, Cincinnati, architects.

Toppan Boat Mfg. Co., Medford, Mass., has been organized by Arthur W. and Wellington C. Toppan, 6 Lakeview Avenue, Winchester, Mass., to operate a boat-building and repair plant.

Blackstone Valley Gas & Electric Co., Pawtucket, R. I., operating Pawtucket Gas Co. and other utilities, has disposed of bond issue of \$2,000,000, portion of fund to be used for extensions and improvements.

Laconia Chamber of Commerce, Laconia, N. H., has closed negotiations with a wood-working company (name temporarily withheld) to take over former plant of Laconia Car Co., comprising four factory units. Equipment will be installed to give employment to about 100 persons.

◀ CHICAGO ▶

Signal Corps Procurement District, 1819 West Pershing Road, Chicago, asks bids until March 29 for 50 generator armatures (Circular 41).

Village Council, Wilmette, Ill., asks bids until April 5 for equipment for municipal waterworks, including motor-driven pumping machinery, and accessories; engine-generator unit with auxiliaries; filter machinery and piping, steel intake pipe line with manifold and inlet drums, etc.; entire project to cost about \$600,000. Pearse, Greeley & Hansen, 6 North Michigan Avenue, Chicago, are consulting engineers.

Common Council, Marengo, Iowa, has called special election on March 28, to approve bonds for \$125,000, fund to be used for a municipal electric light and power plant.

Alton Railroad Co., 340 West Harrison Street, Chicago, is increasing operations at repair shops at Bloomington, Ill., and has added about 125 men to working quota.

Village Council, Villisca, Iowa, has called special election on March 28 to approve erection of municipal electric light and power plant, and bond issue of \$150,000. Edwin E. Jenkins is village clerk.

United States Engineer Office, First District, Chicago, asks bids until March 25 for a control house at Brandon Road Lock, Des Plaines River (Circular 104).

Chicago & North Western Railway Co., Chicago, is increasing operations at local car repair shops, reinstating about 450 men; work at locomotive shops is being maintained on basis to give employment to about 500 men, who returned to work a few weeks ago.

Ford Motor Co., Dearborn, Mich., has resumed operations at branch plant at Minneapolis, recalling about 1700 men.

Holland Furnace Co., has announced that it will reopen its plant No. 2 at Cedar Rapids, Iowa, returning 85 men to work. Plant has been closed since Nov. 14.

Horsburgh & Scott Co., Cleveland, manufacturers of industrial gears and speed reducers has opened a Chicago office at 844 Rush Street.

◀ MILWAUKEE ▶

Board of Education, Plymouth, Wis., closes bids March 19 for new \$250,000 senior-junior high school, with manual training department. H. W. Tullgren, 1234 North Prospect Avenue, Milwaukee, is architect. Walter B. Sentry is superintendent of schools.

Four Wheel Drive Auto Co., Clintonville, Wis., has received repeat order from Sun Ning Railroad in southern China for fourth gasoline locomotive for short line service.

Gillette Rubber Co., Eau Clair, Wis., contemplates investment of \$100,000 in equipment for modernizing its tube department. Work is being completed on installation of new 2100-hp. boiler with underfeed stoker equipment at cost of \$50,000.

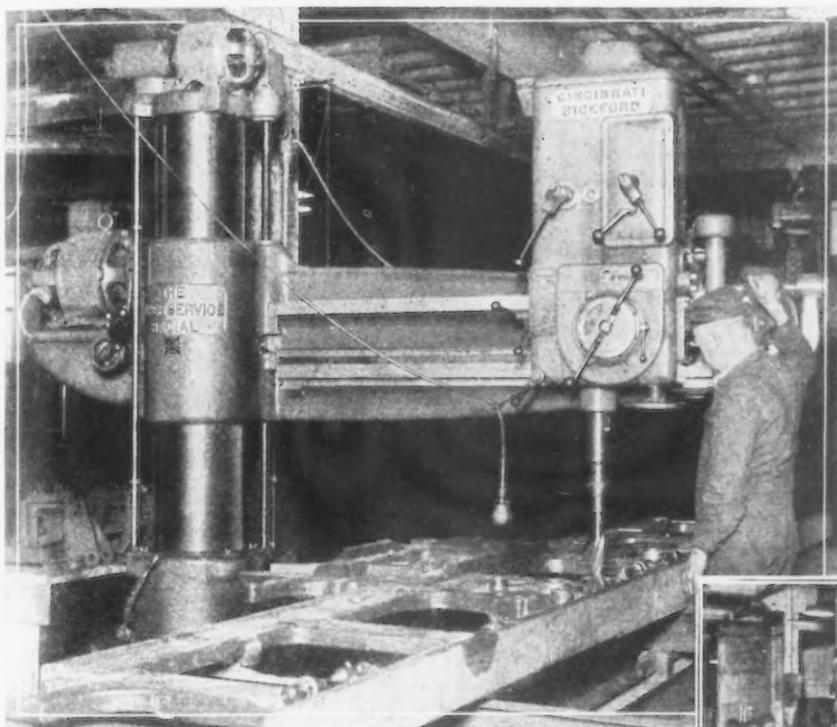
◀ GULF STATES ▶

Continental Can Co., 521 North Scott Street, New Orleans, with headquarters at New York, let general contract to R. P. Farnsworth & Co., Inc., Maritime Building, New Orleans, for three-story plant, 120 x 160 ft., at Harvey, La., primarily for tin can manufacture for Penick & Ford, Inc., food products. Cost

SUPER PERFORMANCE

in drilling printing press frames

SAVES 35%!



You have heard a lot about "modernizing." Here's the way it works out in actual practice.

For example, this job consists of printing press frames, each containing 90 holes from $\frac{1}{2}$ " to $3\frac{1}{2}$ " dia., and from $3\frac{1}{2}$ " to $6\frac{1}{4}$ " deep. Most of them are reamed or tapped—thus requiring many changes in feeds and speeds.

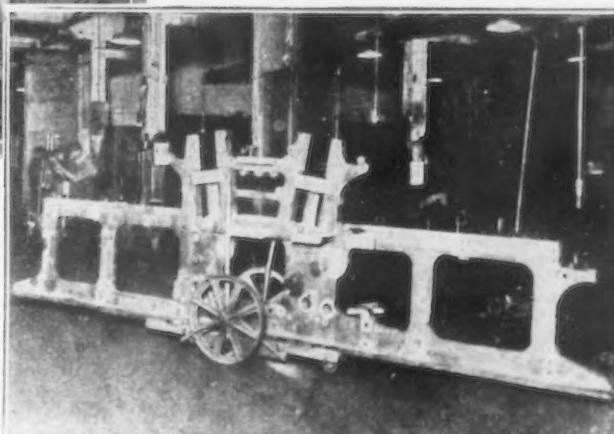
The SUPER-SERVICE RADIAL drills this side frame for a large printing press in 9 man-hours. Formerly two machines and 14 man-hours were required.

Former method required two 6 ft. radials working side by side, and 14 man-hours of labor.

Up-to-date present method

requires only one 6 ft. Super-Service Radial and only 9 man-hours of working time.

This typical example of Super-Service economy is due to the centralized control by which 36 speeds, 18 feeds and all movements of the head and arm are at the operator's finger tips at all times. This is accomplished without sacrificing the ad-



vantages of constant speed drive. There are other up-to-date features of design and operation, too, which you ought to know about. Let us send you further data.

The SUPER ~ SERVICE Radial

THE CINCINNATI BICKFORD TOOL COMPANY, OAKLEY, CINCINNATI, OHIO

about \$175,000 with equipment. Favrot & Livaudais, Hibernia Building, New Orleans, are architects.

Constructing Quartermaster, Fort Ringgold, Tex., asks bids until March 31 for quantity of copper storm anchors, bolts, hinges, electrical supplies, etc. (Circular 2).

Enterprise Machine & Foundry Co., Hatiesburg, Miss., plans rebuilding part of shops recently destroyed by fire. Loss about \$35,000 with equipment.

Pan-American Petroleum & Transportation Co., Canal Bank Building, New Orleans, plans erection of one-story bulk oil storage and distributing plant near Destrehan, La., with tanks, pumping equipment, etc. Cost close to \$45,000 with equipment. Headquarters at 122 East Forty-second Street, New York.

Mentone Oil & Refining Co., Arno, Reeves County, Tex., recently organized, has approved plans for local oil refinery, to cost over \$85,000 with machinery.

Davison-Pick Fertilizers, Inc., Whitney Central Building, New Orleans, manufacturer of commercial fertilizers, plans rebuilding part of plant at Gretna, La., recently destroyed by fire. Loss over \$125,000 with equipment.

◀ INDIANA ▶

Indianapolis Wire Bound Box Co., 1300 Beecher Street, Indianapolis, asks bids on general contract for one-story plant, 150 x 200 ft., at Fernwood, Miss. Company proposes to remove main plant to that place and will increase capacity. Cost over \$50,000.

Stutz Motor Car Co., 1002 North Capitol Avenue, Indianapolis, is increasing operations and adding to working force. Company is purchasing raw materials on a basis double of that 60 days ago, and has more unfilled orders than at any time during past nine months.

Board of Trustees, Indiana State Teachers' College, Indianapolis, plans new training school with vocational facilities at Terre Haute. Cost about \$400,000 with equipment.

Studebaker Corp., South Bend, is increasing production for manufacture of passenger cars and trucks. Sales in February were 13 per cent over those for corresponding month last year, and 68 per cent in excess of those for January this year.

◀ DETROIT ▶

Motor & Machinery Castings Co., 7742 West Davison Street, Detroit, let general contract to W. J. C. Kaufman Co., 10610 Shoemaker Street, for one-story foundry addition. Cost over \$25,000 with equipment. Angell & Shreve, Book Building, architects.

Sparks-Withington Co., Jackson, Mich., manufacturer of radio equipment, automobile appliances, etc., has production under way on Spartan electric refrigerator units at plant near Michigan Center, a new line of manufacture, and plans increase in output. Company is giving employment to about 1250 persons.

Continental Motors Corp., Jefferson Avenue East, Detroit, has organized Continental-DeVaux Co. to take over and operate DeVaux-Hall Motors Corp., Grand Rapids, Mich., recently acquired. Company will resume production of automobiles, following financial difficulties of DeVaux-Hall organization. W. R. Angell, Roger Sherman and F. K. Beall head new company.

City Council, Iron River, Mich., has called special election on April 4 to approve bond issue of \$75,000, fund to be used for erection of municipal electric light and power plant.

Logan A. Papworth Co., Howell, Mich., has been organized by Logan A. Papworth and William H. Burdick, both of Howell, to manufacture agricultural equipment and implements.

Gar-Wood, Inc., Marysville, Mich., manufacturer of motor boats, is increasing production and plans early reinstating of more than 150 former employees.

Holmes Foundry Co., Port Huron, Mich., is stepping up production and is giving employment to about 450 men on five-day week schedule.

Consumer's Steel Products Corp., Vermont and Porter Streets, Detroit, has arranged for an increase in capital from \$10,000 to \$50,000 for expansion.

Penin-U'ar Metal Products Co., Vincent and Dodge Streets, Hamtramck, Detroit, will occupy a new plant, 50 x 240 ft., one story, now being constructed for it under a lease arrangement by F. L. Bromley Properties, Inc. Plant is being erected by Austin Co., Cleveland, and will cost \$25,000.

◀ PITTSBURGH ▶

Duplate Corpn., New Kensington, Pa., manufacturer of safety sheet glass, is enlarging plant to double present capacity, totaling over 50,000 ft. a day. About 200 men will be added to working force.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until March 22 for one extensometer, with two marking-off tools, fittings, etc. (Schedule 7678) for Munhall, Pa., naval station.

Penn Charcoal & Chemical Co., Smethport, Pa., recently organized, has acquired local plant of Smethport Wood Products Co., defunct, and will remodel for manufacture of industrial chemical products.

Pennsylvania Electric Co., Johnstown, Pa., has purchased hydroelectric power plant, power dam and water rights of Clarion River Power Co., on Piney River, near Foxburg, Pa., for \$6,500,000, and will increase power supply. Extensions in transmission lines are planned.

United States Engineer Office, Pittsburgh, asks bids until April 22 for construction of twin locks for Montgomery Island dam, Ohio River, near Midland, Pa., one lock chamber to be 110 ft. wide and 600 ft. long, and auxiliary lock, 56 ft. wide and 360 ft. long. Cost about \$6,000,000.

Norfolk & Western Railway Co., Roanoke, Va., plans rebuilding tipple conveyor at its Pond Creek Collieries, Williamson, W. Va., recently damaged by fire.

Works Committee of City Council, City Hall, Pittsburgh, is planning purchase of automatic coal-burning equipment for heating boilers at East End asphalt plant. C. M. Reppert is city engineer.

◀ CINCINNATI ▶

Columbus Railway, Power & Light Co., North Front Street, Columbus, Ohio, has plans for addition to power substation. Cost about \$40,000 with equipment.

Constructing Quartermaster, Fort Knox, Ky., asks bids until March 25 for one gasoline storage tank, capacity 10,000 gal. (Circular 35); until March 28 for quantity of galvanized conduit, pipe straps, screws, sockets and other electrical supplies (Circular 36).

Board of City Commissioners, Piqua, Ohio, plans early call for new bids for municipal electric light and power plant, including turbo-generator, surface condenser, boilers and accessories, mechanical fans, etc. Cost about \$800,000. Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., consulting engineer.

Contracting Officer, Material Division, Wright Field, Dayton, Ohio, asks bids until March 22 for one airship observation car winch (Circular 305); until March 23 for quantity of steel tubing (Circular 306); until March 28 for brass rods, sheet copper and copper tubing (Circular 307); until March 29 for mild carbon steel bars (Circular 310).

Southern Cotton Oil Co., Memphis, Tenn., is considering installation of new storage and distributing tanks and auxiliary equipment. Cost about \$41,000.

Peoples Aetna Oil Co., Factory Street, Harrisburg, Ky., plans installation of additional tanks for storage and distribution at gasoline plant.

◀ ST. LOUIS ▶

Board of Jackson County Commissioners, Independence, Mo., Leo E. Koehler, county engineer, asks bids until March 22 for one gasoline power shovel, equipped with trailer. Stayton & Veatch, Interstate Building, Kansas City, Mo., consulting engineers.

McQuay-Norris Mfg. Co., 2320 Cooper Street, St. Louis, manufacturer of piston rings and kindred automobile engine equipment, has purchased 4-acre tract at York Township, adjoining Toronto, Ont., as site for new plant. Plans for first one-story unit are being completed. Cost about \$60,000 with machinery. Five additional one-story structures will be built later, entire project to cost over \$400,000. Nelson A. Hardie, Toronto, Canadian representative for company, will be plant manager.

Contracting Officer, Quartermaster Corps, Fort Riley, Kan., asks bids until March 23 for quantity of iron pipe, cable, pipe wrenches, conduit boxes, galvanized culverts, nails, screws, door locks, barn door hangers, wire and other equipment (Circular 54).

Phillips Petroleum Co., Bartlesville, Okla., plans oil storage and distributing unit at McAlester, Okla., including battery of four 12,000-gal. tanks, pumping and auxiliary equipment.

St. Louis Southwestern Railway Co., St. Louis, is increasing operations at locomotive and car shops at Pine Bluff, Ark., and about 225 men have been reinstated.

Board of Trustees, Kansas State Agricultural College, Manhattan, Kan., plans installation of television radio broadcasting station, with steel towers, power equipment, etc.

◀ PACIFIC COAST ▶

Western Canning Co. Ltd., Chico, Cal., let general contract to Harry Schuster, Ltd., 354 Hobart Street, Oakland, Cal., for new plant at Chico, consisting of one-story unit, 80 x 200 ft., one-story storage and distributing building, 45 x 90 ft., and steam power house, 30 x 40 ft. Cost about \$80,000 with equipment.

Anozira Mining & Milling Co., 124 West Fourth Street, Los Angeles, is planning new milling plant at copper properties at Salome, Ariz., with administration building and other units. Cost over \$400,000 with equipment.

Southern Sierras Power Co., Riverside, Cal., plans extensions and improvements in transmission lines and distributing system in Imperial Valley district, near El Centro, Cal. Cost about \$150,000. Joseph E. King is district manager at El Centro.

United States Engineer Office, Portland, is asking bids (no closing date stated) for two boilers and boiler equipment for dredge Col. P. S. Michie.

City Council, Stockton, Cal., Col. B. C. Allin, port director, plans erection of two one-story steel sheds, each 135 x 1000 ft., in connection with wharves, etc., for harbor improvements, including mechanical-handling equipment. Cost about \$500,000.

Loose-Wiles Biscuit Co., 1100 West Eighth Street, Kansas City, Mo., has plans for five-story and basement plant, 105 x 270 ft., at Los Angeles, for which bids will be asked soon. Cost about \$1,000,000 with machinery. Claud Beelman, Union Bank Building, Los Angeles, is architect.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until March 22 for 24 one-piece hollow forged exhaust valves (Schedule 7674); until March 29 for one motor-driven planer and jointer (Schedule 7655) for San Diego Navy Yard; until March 25 for radial electric drills (Schedule 4542), original date of opening Dec. 2, supplemental bids now asked; until March 29 for 132, 900 lb. sheet steel (Schedule 7653), 15,300 lb. naval bar brass (Schedule 7664) for Mare Island Navy Yard.

Pacific Gas & Electric Co., 245 Market Street, San Francisco, has awarded general contract to J. B. Petersen, 4021 Agua Vista Avenue, Oakland, for equipment storage and distributing plant at Concord, Cal. Cost about \$40,000 with equipment.

United States Engineer Office, Seattle, asks bids until March 22 for two 175-hp. gasoline engines, two propellers with shafts, bearings, etc., for motorboat service.

◀ FOREIGN ▶

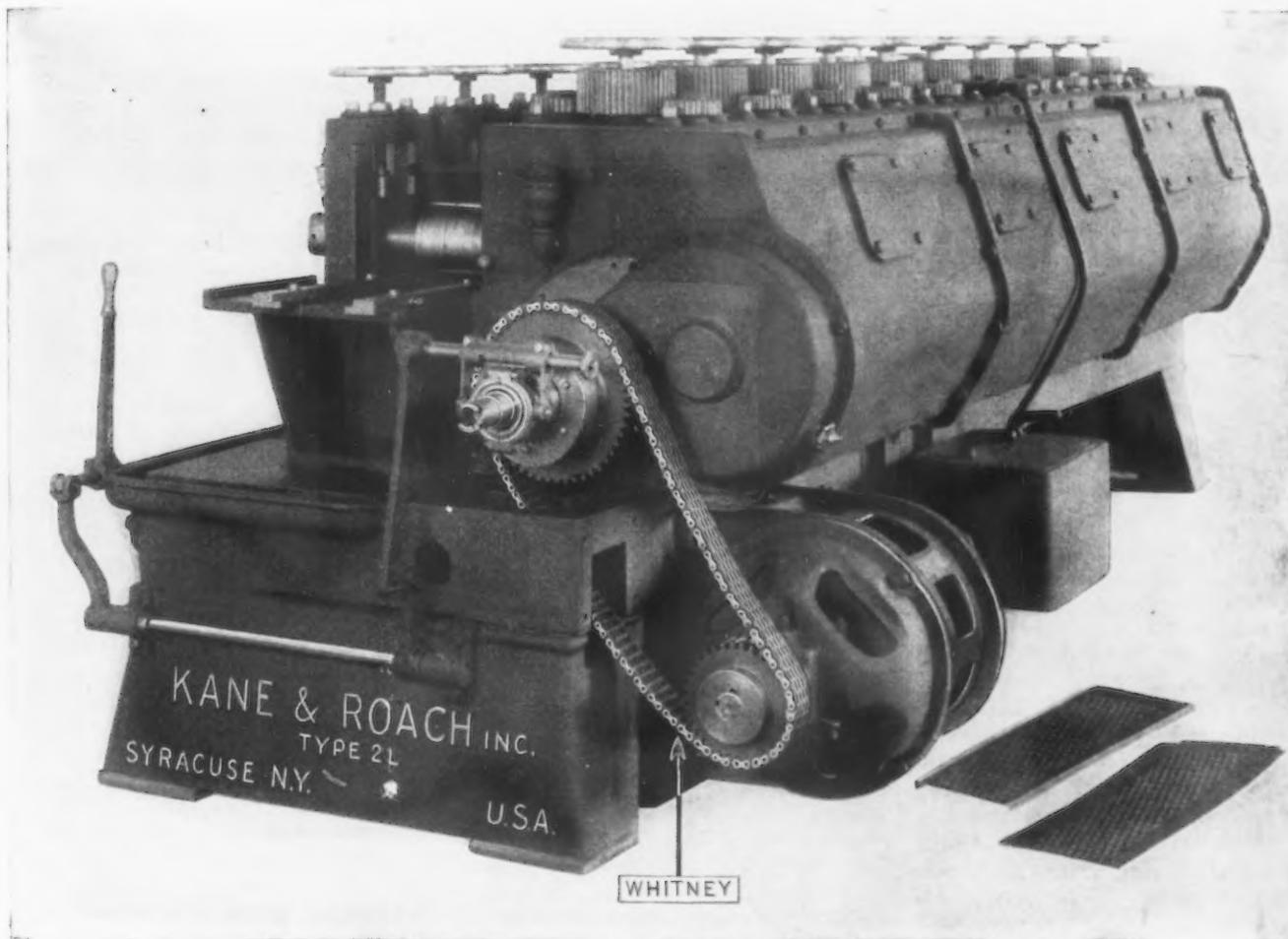
Ministry of Agriculture, Buenos Aires, Argentine Republic, has authorized fund of \$1,250,000 for new oil refinery at LaPlata. Most of output will be used for production of lubricating and other processed oils.

Aviation Department, Government of France, Paris, is securing fund of 75,000,000 fr. (about \$2,925,000) for Continental and Colonial air development program, including establishment of number of airports and landing fields, with hangars, repair shops and other field units. Entire fund later will total 4,000,000,000 fr. (about \$156,000,000) for work.

Nippon Electric Power Co., Tokyo, Japan, plans new hydroelectric generating plant at Kanetsuri, on Kurobe River, with capacity of about 72,000 kw. Cost over \$1,000,000 with transmission system.

Minister of Public Works, Bogota, Columbia, let contract to Frederick Snare Corp., 111 Liberty Street, New York, for construction of ocean and river port works at Cartagena, including dredging of harbor. Work will consist of new 1065-ft. wharf, warehouses and other units, railroad connections, etc., with conveying, loading and other mechanical equipment. Cost \$2,850,000. Andean National Corp., Cartagena, a Canadian subsidiary of Standard Oil Co. of New Jersey, operating properties and pipelines in Colombia, is interested in project and will defray about \$1,000,000 of cost noted. Program is scheduled for completion in 27 months.

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**WHITNEY SILENT
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ROLLER CHAIN DRIVES**
FOR POSITIVE POWER TRANSMISSION

Lubricants for Ball and Roller Bearings

(Concluded from page 673)

that the solution of the problem should be sought from the lubrication angle.

A study of the failure of a large size roller bearing is of considerable interest. When the combined load and speed conditions are such that the factor of safety of the bearing is exceeded, considerable heat begins to develop in the localized pressure areas, which gradually increases to the point where the lubricating film thins out and finally breaks down so that direct metal-to-metal contact takes place. The heating is primarily due to the excessive metallic deformation of the rollers and the hardened surfaces of the races.

This condition is steadily aggravated until the temper of the hardened surfaces is drawn, after which the rate of deformation becomes greater, together with an increase in friction. If one of the rollers happens to fracture, the failure is of a mechanical nature and the bearing seizes through the particles from the fractured roller acting as wedges on the other rollers. Failure may also take place by the rollers becoming welded to the inner race as the heat being generated at the pressure areas becomes sufficiently intense for welding action to take place.

The usual wear and scoring in a plain bearing may be explained in a similar manner. Where the metals are dissimilar, such as a steel shaft rubbing on a brass or babbitt-lined bearing, scoring usually results in direct wear. Where, however, the rubbing surfaces are of the same metal, as in the case of ball and roller bearings, scoring results from actual fusion of the microscopic surface in intimate contact under the intense localized heat of friction. With perfect lubrication, of course, there is no direct metal-to-metal contact and the heat of friction is low but when lubrication is only partial, welding action occurs, and as the fused particles are torn apart by the force of rotation, other particles become fused. This action becomes steadily aggravated until the rollers and races become so badly scored that the entire bearing has to be replaced.

An idea of the effect of intense localized heat may be gained by observing the manner in which an ordinary match is ignited. The coating on the tip of the match (particularly of the so-called "safety matches") does not become ignited unless it is brought into contact with a very hot substance, but when the match is rubbed against a prepared rough

surface the heat localized at the microscopic rubbing areas is sufficiently high to ignite the match tip.

The theory of fusion outlined above was substantiated by observing several roller bearing failures which came to the writer's attention. On a 4½-in. bore roller bearing operated at 1400 r.p.m. and lubricated with a circulating oiling system, failure took place after eight months of continuous service. An examination of the bearing showed that the compartments in the steel cage were worn, allowing the rollers to depart from their axial alignment and to skew between the races. Despite the cooling effect of the oil circulated through the bearing, about three-quarters of the rollers were found to be firmly welded to the inner race.

Another bearing of about 16 in. bore, when subjected to a sudden extreme overload, did not show any fracture of the rollers, but the temper of the steel in the balls and rollers was drawn, so that the surface layers of the races were rolled out into fine ribbons and flakes of metal. The stream of oil circulated through this bearing apparently did not have sufficient cooling action on the heat generated through the deformation of the elements beyond the elastic limit of the steel.

Develops Grease Having Extreme Pressure Features

A fluid lubricant for extreme pressure conditions in the lubrication of gears and bearings has been on the market for some time. An outstanding lubricant of this type consists of a combination of blended oils with lead oleate. The underlying theory of lead oleate compounds as a "border line" lubricant is that when the unit pressure gets to be so high that the mineral oil film breaks down, the lead oleate which it contains starts to function as a lubricant, and in some catalytic way the lead oleate brings out the anti-friction and anti-flux properties of the ingredients contained in the base oil.

For example: tests have shown that under a pressure of approximately 8000 lb. per sq. in. the oil film from a mineral oil like cylinder stock breaks down completely, and scoring immediately takes place on account of the metal-to-metal contact of the rubbing surfaces. Similar tests have shown that the leaded lubricants withstand unit pressures up to 48,000 lb. per sq. in. In other words, lead oleate lubricants have a factor of

safety nearly six times greater than ordinary straight mineral oil.

It was logical, therefore, that the grease makers would start manufacturing a grease suitable for the lubrication of large roller bearings into which some of the features of a lead oleate would be incorporated, and which would be suitable for the extreme pressures encountered in roller bearings. The product which was perfected along these lines has proved to be an effective remedy not only as an emergency lubricant, but also as a product suitable for roller bearing applications in general, whether the pressures are high or low, as the factor of safety which it provides insures effective lubrication under normal as well as under abnormal conditions.

This type of extreme pressure grease possesses all the characteristics of a good grade of a regular grease, insofar as lubrication or oiliness and the preservation of a smooth roll surface from pitting, rusting and wear are concerned, and in addition, provides from three to four times greater protection under extreme speed and pressure conditions.

No attempt has been made here to give chemical analysis of lubricants for the reason that any specifications as to the percentage of the different ingredients entering into the manufacture of greases is of very little practical value. Two greases made by different manufacturers to the same formula will often show a great difference when applied to the same work. One will perform satisfactorily while the other may fail. This is due to the difference in the method and skill applied in manufacture.

It is far safer to purchase grease and oils on the basis of performance in preference to any arbitrary analysis specifications.

In conclusion, it should be emphasized that each individual bearing application is a problem in itself, and on the more important installations a special study of the lubrication requirements should be made. The engineering departments of the several ball and roller bearing manufacturers have a wealth of information on the lubrication of the bearings of their manufacture operated under different conditions. However, the bearing manufacturer cannot be held responsible for the performance of any particular lubricant, so that the problem eventually resolves itself in having the user avail himself of the recommendation of the bearing manufacturer and then make sure that the recommended lubricant is purchased from a reliable manufacturer.

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